Regional Labour Market Analysis and Policy Evaluation: Job Insecurity, Flexibility and Complexity. Evidence from Switzerland

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To my family

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Introduction

Introduction

My dissertation contains three independent chapters in the area of labour economics. All the chapters deal with labour market flexibility, security and complexity. Two of the chapters relate specifically to perceived security, flexibility and job satisfaction while the last investigates labour market programs and their impact on a regional labour market.

Switzerland is characterized by a relatively strong market performance with high rates of employment; federal laws regulate the policy of the labour market but the Canton is the level of implementation of concrete initiatives. Studying the criteria of efficiency and effectiveness to be applied to labour market policies cannot therefore fail to know in detail the regional labour market, the skills level and the degree of dynamism and security of labour markets.

Consequently, the geographical position in the European context, the federalist structure, the high share of immigrant workers are interesting factors. Moreover, the small scale of the country and the presence of different regional labour markets should imply spatial concentration and differentiation of the economic structure among regions. Finally, Switzerland provides a particularly appropriate market to examine the potential effects of "flexibility and security" type arrangements due to the relatively high incidence of part-time contracts and flexible employment contracts: in 2010, 21.9% of the 182,000 temporary employees had a contract that would have expired within six months. Another 53.5%, however, had an employment relationship in duration from six months to two years.

For this reason, I devoted particular attention to job satisfaction and job insecurity as economic variables, since growing literature shows that, in order to determine what dynamics impact on general workers' well-being, the relationships between these variables is a crucial factor (Boeri and Garibaldi, 2007).

Indeed, over the last couple of decades, because of the intensification of competitiveness due to market globalization together with the spread of new Information and Communication Technologies (ICT), policy makers have been trying to enhance the flexibility and improve the performance of European labour markets through the application of extensive labour market reforms. An aspect of these reforms has been the simplification of the restrictions regulating the use of temporary employment contracts (OECD, 2006) and the wide spreading of so-called flexible contracts such as fixed-term contract and temporary agency work. After a first period of increasing feeling of insecurity, during the '90 it decreased, although with important differences between countries (Auer and Cazes, 2003).

The balance between labour market flexibility and security is therefore a lively policy issue: investigating the perception of job insecurity is important for several reasons. The presence of an economic literature in this field is recent, and there are many significant empirical questions to address.

Economic restructuring constitutes indeed a long-term phenomenon (Fallick, 1996; Hipple, 1997), driven by a global marketization, a greater service industry growth relative to growth in other sectors and a rising premium for specialized skills related to technology shifts. Long-term work contracts are perceived to be costly, so their numbers are reduced and all the factors outlined above foster employers' perceptions of the need for market efficiency, which rationalises a reduction of the workforce.

Consequently, full-time and long-term employees express insecurity related to retaining current jobs and acquiring new ones; moreover, although mature workers may not "feel" the market forces that may be behind labour market changes, they perceive the relative insecurity of their own current employment. Are these concerns about job security related to the restructuring of their own occupations and industries? According to literature workers in industrial sectors with high displacement rates and in occupational sectors with high contingent employment rates are more likely to perceive job insecurity (Elman and O'Rand, 2002).

In effect, studies conducted at the European level found that the performance of the worker is deeply influenced by the perception of job insecurity that alters physical and psychological well-being (Chirumbolo and Hellgren, 2003) and the workers' job satisfaction and general employment loyalty (Sverke and Goslinga, 2003).

The perception of job insecurity may also demotivate workers to invest their time and financial resources in education and training, as opposed to acquisition of additional firm-specific human capital (Elman and O'Rand, 2002). In addition, studies suggest that the perception of job insecurity can directly affect consumption and employment, and may undermine the workers' bargaining power in negotiations with their employers (Manski and Straub, 2000).

For this reason, the purpose of this thesis is, at first, to shed light on the perceptions of job insecurity among Swiss workers and evaluate whether these perceptions are consistent with actual economic outcomes.

Moreover, in principle, temporary employment can have both positive and negative welfare consequences for workers. A flexible scheduling arrangement and other aspects of the daily work experience related to temporary work, indeed, may be valued and preferred by some employees, whereas the insecurity and poorer working conditions associated with these contract types can have a negative impact on workers' welfare (Blanchard and Landier, 2002). Employment stability is instead desirable both for workers, who rank it as one of the most important factors for job satisfaction (European Commission, 2001), and for firms, which dislike high turnover and prefer stable employment relationships in order to retain human capital investment and reduce both workforce screening and selection costs. On the other hand, the recent intensification of competitive pressures has called for more flexibility in labour markets for both firms and workers.

Since the '70, psychologists and sociologists have been extensively analysing "job satisfaction" and, starting from Freeman (1978), this variable has been also recognized as an important economic variable in order to describe the economic life and the personal behaviour in the labour market.

According to recent economic literature, job satisfaction is important for at least two reasons: it increases the productivity of labour and therefore the productivity of firms and it can improve overall social well-being, being closely related to individual happiness and well-being (Bruno, Caroleo and Dessy, 2013).

A growing number of studies have investigated the determinants and consequences of differences in individuals' reported job satisfaction. Research in psychology and sociology has emphasized that job satisfaction depends not only on the remuneration for the job but also on other workplace characteristics like career prospects, job security, job content, autonomy at work, and interpersonal relationships. Most of the studies in this strand of research show that job security and job content are the most influential determinants when it comes to explaining job satisfaction (D'Addio et al., 2007; De Cuyper et al., 2009).

The main important issue, regarding this area of interest, is therefore to determine what factors influence the perception of security in the workplace and its impact on the welfare of workers.

In summary, the economic literature identifies two different relationships between job security and flexibility:

- the *"trade-off" theory*, which implies a negative relationship between flexibility and security. According to this hypothesis a high level of job security can only be achieved at the cost of poor flexibility and flexible employment patterns are in conflict with job security;

- the *"flexicurity" approach*, which instead assumes that flexibility and security are not contradictions, but they can be mutually supportive, with the implementation of the right labour market policy.

Using micro data, this work aims therefore to empirically assess the effect of a "flexicurity arrangement", measured at a micro-level scale, on

workers' job satisfaction over the course of the business cycle period (2008-2011).

A second relevant issue that has been neglected by labour economics is the role of growing complexity in the labour market.

In the last decades, determining the effects of labour institutions on macroeconomic performance has been a central concern of economic policymakers. The process through which firms and workers meet in the labour market and how this matching process affects (un)employment dynamics and wage setting, and the magnitude of this interaction over the business cycle (Merz, 1995) has been a central issue in labour economics. Diamond, (1982) and Mortensen and Pissarides (1994), for example, defined a theory based on the "representative individual hypothesis", which postulates hyper-rational firms and workers or implies static equilibrium conditions. This instrument, called matching function (MF), allowed labour economists to model employment out-flows and in-flows in the presence of frictional labour markets. Unfortunately, as discussed by Acemoglu and Shimer (2000) and Blau and Kahn (2000) it is difficult to obtain conclusive empirical results regarding how labour institutions react to economic performance. For example, the endogeneity makes it difficult to interpret the validity of empirical investigations because governments continually revise labour institutions in response to economic and political pressures, and it is consequently difficult to apply regression methods connecting changes in labour institutions to economic outcomes.

There is another reason for which the study of the matching process should incorporate agent's behaviour in its specification. Education and labour policy literature (Pascarella and Terenzini, 2005; Goldberg and Smith, 2007; Edgerton et al., 2012) assumes workers in unstable market sectors more likely to retrain, but workers' labour market locations may provide differing incentives or disincentives for education and retraining. The objective to pursue human capital accumulation through further education is reduced in labour markets with limited workplace

opportunities. This generates educational reactions that push higher numbers of workers into postsecondary education and stimulate educational institutions. According to this literature, workers who perceive job insecurity are more likely to pursue educational activities.

For this reason the issue of micro-foundation of MF has been intensively studied, and a growing number of studies highlights that the assumed MF should be consistent with labour market behaviour of firms and workers and that the MF could be endogenous (due to agents' behaviour that can be affected by labour market policies and institutions), implying instability and vulnerability (Neugart, 2009).

Recently, Agent-based Computational Economics (ACE) has been proposed as a radically different interpretative strategy (Tesfatsion, 1998) in order to support labour policy makers in their decisions: a similar argument holds for many policy questions, which are typically related to at least some aspects of economy, technology, and actor behaviour (Chappin, Chmieliauskas and de Vries, 2012). With agents in a computer, it becomes possible to recreate actual world on an artificial basis, to see the effects of the action and interaction.

In social science, indeed, models are generally built in two ways, as a verbal argumentation or as mathematical equations, typically with statistics and econometrics. The first way is absolutely flexible and adaptable, but mere descriptions and discussion, by their nature, preclude tests and verifications of hypotheses. In contrast, the second way allows for computations and verifications, but suffers from severe limitations in flexibility and adaptation, especially with respect to how agents are expected to operate in the model and when accounting for their heterogeneity and interactions (Terna, 2013).

Computer simulation, which can be considered as a "third way", can combine the extreme flexibility of a computer code where it is possible to create agents who act, make choices, and react to the choices of other agents and to modification of their environment and its intrinsic computability. This approach allows researchers to use the descriptive capabilities of

verbal argumentation and the ability to calculate the effects of different situations and hypotheses together.

However, the application of agent-based models (ABMs) for policy evaluation is still limited because ABMs might confront policy makers with the fact that for many of their objectives, they have limited control options. On the other hand, if ABMs are built with sufficient richness and organization to be applicable to real policy questions, simulation can act as a sort of "magnifying glass" that may be used to understand reality in a better way.

Moreover, these new approaches are challenging, because new modelling techniques such as ABM are not established in the way that traditional ones are (Lejour et al., 2006). It is not possible, indeed, to assess the macroeconomic consequences of labour market policies using a pure micro-approach; in the same way a macro-approach does not permit to look at an individual level, making impossible to evaluate the impact of Labour Market Policies on a precise target group. Agent-based labour market models allow the extraction of information based on aggregate outcomes that are fully explained by the characteristics of the agents and the systemic structure of their actions.

Since these type of models simulate complete sets of individual observations they have also an interest in addition to the micro-econometric evaluation approach ex post. A final advantage is that the simulation at the individual level can help to formulate hypotheses on the micro-economic agent's behaviour using simple and intuitive rules, closer to the reality that the abstraction of rational aggregate models. This greater attention to the micro-economic reality behaviour characterizes the current ACE research (Testfasion, 2006).

Finally, is then of interest to link micro-level and macro-level evaluations with an integrated (micro/macro) simulation model, trying to further diversify the battery of instruments used for Labour Market Policies evaluation.

The issues outlined above are developed in three essays. The first investigates the perceptions of job insecurity among Swiss workers over the course of the business cycle and evaluate whether these perceptions are consistent with actual economic outcomes. Following the literature, I employ two measures to assess worker perceptions of job insecurity: one reveals workers' concerns about job loss, and the second evaluates their degree of satisfaction with their job security by means of a verbal scale. Using data from the longitudinal Swiss Household Panel (SHP) I therefore categorize workers according to their socio-demographic characteristics, job characteristics and Canton of residence and my descriptive analysis focuses on workers who perceived their job situation as insecure during this period. Using ordered probit analysis, I finally study how job insecurity varies by worker characteristics, over time and by current socio-economic conditions (unemployment rate and percentage of foreign population).

The second essay assesses the effect of a micro-level measure of flexicurity on workers' job satisfaction using individual-level data from the longitudinal Swiss Household Panel (SHP), related to temporary and permanent employees in Switzerland for the period 2005 to 2010. The sample of workers is disaggregated into different groups according to their employment contract (permanent or temporary) and their perceived job security; I analyse whether workers who are heterogeneous in terms of both the type of labour contract and their perceived security do also differ with regard to life satisfaction and specific aspects of the job satisfaction. Using Probit OLS or POLS, that consists in transforming an ordinal dependent variable in a "pseudo" continuous one, and allows the application of a linear model, I estimate a linear fixed effects model, thus controlling for unobserved time-invariant characteristics. I also extend my analysis and seek to identify how insecurity affects temporary workers compared to permanent workers examining the impact of regional labour market conditions.

The third essay, that follows (ACE) models approach, seeks to identify traceable connections between micro and macroeconomic scales exploring

the regional labour market. It defines a virtual regional labour market with firms and worker agents. During the simulation periods firms, that are assigned different sectors and have sector-specific skill requirements, open vacant positions and receives applications; then randomly choose one applicant which fit with the firm's skills requirement. Firms are also hit by shocks and dismiss their employees that are "too costly". Moreover, unemployed workers have to invest in their human capital to qualify for vacancies opened in different sectors. Following the exposed perspective, I have developed a case study to test and validate the application of the proposed model and framework, exploring the regional labour market in the southern Switzerland (Ticino and some districts of the Grisons). At this point, the model is still experimental and calibration is very preliminary but it already allows to approximate a quite a number of stylized features of the southern Swiss regional labour market.

In what follows, it is therefore at first presented the analysis of the perceptions of job insecurity among Swiss workers, then the investigation of the determinants of a perceived job satisfaction measure of flexicurity on workers' job satisfaction, and finally the contribution that illustrate a regional labour market model with sector specific requirements and a procedure to evaluate Active Labour Market Policies.

A conclusion paragraph draws results and conclusions of the dissertation.

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Chapter 1

Perceptions of job insecurity among Swiss workers, 2008-2011

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Abstract

Even though, from 2008 to 2011, the Swiss economy was for the most part in a state of positive growth, from mid-2008 up to the first quarter of 2009, three consecutive quarters of declining gross domestic product (GDP) were registered (concomitant with the crisis in the financial markets), which had a negative structural effect on the labour market. Moreover, in the same period, the number of economically active foreign nationals grew by 18.5%, while the number of economically active Swiss nationals grew only by 5.7%.

Our objective is thereby to study perceptions of job insecurity among Swiss workers over the course of this period and evaluate whether these perceptions are consistent with actual economic outcomes.

Following the literature, we employ two measures to assess worker perceptions of job insecurity: one reveals workers' concerns about job loss, and the second evaluates their degree of satisfaction with their job security by means of a verbal scale. Using data from the longitudinal Swiss Household Panel (SHP) we therefore examine perceptions of job insecurity among Swiss workers in 2008 and 2011. We categorize workers according to their socio-demographic characteristics, job characteristics and Canton of residence and our descriptive analysis focuses on workers who perceived their job situation as insecure during this period. Using ordered probit analysis, we finally study how job insecurity varies by worker characteristics, over time and by current socio-economic conditions (unemployment rate and percentage of foreign population).

We find that, in analogy to previous studies, perceptions of job security are higher among workers with supervisory responsibilities and among workers who live in Cantons with favourable economic conditions (not only a low level of unemployment), confirming that the worker

perceptions depends on concrete labour market conditions and also on a complex set of subjective perceptions.

JEL codes: J28, J71

Keywords: perceptions; job insecurity

1. Introduction

The concept of employment insecurity refers to all forms of welfare-reducing uncertainty surrounding employment, encompassing uncertainty over the continuity of the current job (job insecurity), uncertainty over the work itself, and uncertainty over future labour market prospects (employment insecurity) (Dickerson and Green, 2012). This broad definition is often simplified in analysis to focus on two components of the mean expected loss arising from the uncertainty: the probability of job loss and its cost (including non-pecuniary losses).

The balance between labour market flexibility and security is a lively policy issue: investigating the perception of job insecurity is therefore important for several reasons.

Studies conducted at the European level found that the performance of the worker is deeply influenced by the perception of job insecurity that alters physical and psychological well-being (Chirumbolo and Hellgren, 2003; Wichert, 2002) and, moreover, the workers' job satisfaction and general employment loyalty (Sverke and Goslinga, 2003).

The perception of job insecurity may also demotivate workers to invest their time and financial resources in education and training, as opposed to acquisition of additional firm-specific human capital (Elman and O'Rand, 2002). In addition, the perception of job insecurity can directly affect consumption and employment, and may undermine the workers' bargaining power in negotiations with their employers (Manski and Straub, 2000).

[Insert Figure 1 about here]

Over the past three decades, the Swiss labour force has grown from about 3 million to 4.5 million people. In most respects, the Swiss labour market has performed above OECD average (Berclaz and Füglister, 2003), in particular when it comes to high employment rates, exceptionally low

unemployment and high wage levels going together with high labour productivity. First of all Switzerland has a liberal and flexible labour market, very similar to the ones found in English-speaking countries (US, UK) insofar as regulatory frameworks are concerned. However, it differs markedly with regard to vocational training and unemployment compensation. The high degree of flexibility and the low tax wedges for low skilled employment is another characteristic of the Swiss labour market.

Secondly, the compromise between export-orientated and domestic producers has contributed to the creation of a segregated labour market: one is orientated towards exportation and is highly competitive. The financial sector, insurances and the pharmaceutical industry are part of this in international comparison. On the other side, there is a well-protected interior market composed by the agricultural and construction sectors: this way of protecting parts of the labour market may be considered as a kind of social policy, which guarantees the maintenance of jobs in those sectors.

Thirdly, the unionization rate is very low. Switzerland has a tradition of cooperation and negotiation between social partners, the so-called "labour peace", concluded in 1937 between firms's organization and trade union. According to this principle, strikes and lockouts are prohibited during the period when collective convention are in force.

The Swiss labour market is therefore characterised by high employment rates, low unemployment and high wage levels. The main factors underlying this good performance are normally considered to be a high degree of labour market flexibility, with decentralised wage bargaining and relatively low employment protection regulations, supported by a strong focus (at least since the mid-1990s) on active labour market policies and employment services characterised by strong "mutual-obligation" principles. Another feature of labour market performance has been the design of immigration policies, which in the past implied the use of immigrant labour as a labour supply reserve that left the country in times of economic hardship (Gerfin and Leu, 2007).

However, Switzerland has not escaped the global economic downturn starting in 2008. GDP growth became negative in the second half of the year, and stayed negative in 2009; economic growth then resumed strongly in 2010. The impact of the recession on the labour market, at first relatively modest, nevertheless led to a 30% rise in unemployment, from 3.5% in 2008 to 4.4% in 2009, and only recently it has been starting going down (4.1% in 2013 - last quarter).

According to the fifth European survey into working conditions (2010), if on one hand, fear of losing one's job is significantly lower in Switzerland compared with EU countries, on the other hand, working hours and deadline pressure in Switzerland are higher than average and there are more complaints of bullying at the workplace. Between 2005 and 2010, an increase was observed in two stress factors, namely long working hours and working under deadline pressure, and nowhere in the EU did these factors have such an effect as in Switzerland.

This paper makes two contributions to the literature. First, the paper adds empirical evidence on job security providing indirect evidence of differences at a Swiss national level. Secondly, considering two different aspects of job insecurity over a period of time allows us to track changes in the perception of workers, addressing the question of whether the perception of job insecurity among Swiss workers are consistent with actual results and the current situation of the labour market in Switzerland.

We use nationally representative data from the longitudinal Swiss Household Panel (SHP) examining perceptions of job insecurity among Swiss workers between 2008 and 2011, a period that registered a negative temporary effect on the labour market (concomitant with the crisis in the financial markets). Following the literature, we employ two measures to assess worker perceptions of job insecurity: one reveals workers' concerns about job loss, and the second evaluates their degree of satisfaction with their job security by means of a verbal scale.

Our analysis of the perceptions of job insecurity is structured as follows. Section 2 reviews measures of employment and job insecurity in

literature. Section 3 describes data and our measures of job insecurity. Results of our descriptive analysis and regression are discussed in section 4, where we also evaluate the extent to which the perceptions of workers are consistent with the current economic conditions. Section 5 presents concluding remarks.

2. Background

To draw significant empirical conclusions about the effects of job insecurity it is necessary to define and appropriately measure the concept of "insecurity". "Job insecurity" is commonly intended to convey the probability that a worker will lose his current job and then not have a comparable position. Theoretical labour economists tend not to use this generic expression in their formal analysis of labour markets, but it is not clear what the term means in the theory of job search (Mortensen, 1986, Mortensen and Pissarides, 1998).

Empirical labour economists have generally avoided direct elicitation of workers expectations. At first they have tried to figure out the perception of job insecurity from the statistics on unemployment rates and durations (Aaronson and Sullivan, 1998; Farber, 2010). Nevertheless, reliable inference on expectations of achievements is difficult to achieve (Dominitz and Manski, 1997) because data on the labour market available to the researcher must be rich enough to allow the simulation of the process of formation of the presumed expectation. Moreover, a researcher must somehow know what information workers possess and how to use this information to form expectations.

Direct elicitation of expectations is an alternative. In consequence, survey questions on job security generally appear in two major forms. Most commonly, individuals are invited to indicate their degree of satisfaction with their job security by means of questions like:

"*How much are you satisfied with your current job or business in terms of job security?"*

followed by a verbal scale as "very satisfied", "somewhat satisfied", "dissatisfied" and so on.

However, this formulation makes the interpretation of the resulting measurement of the job insecurity problematic because it contains an important subjective element (the meaning of "satisfied" or "job security" can vary from person to person). Moreover, it complicates the perception of the respondent at least in two different components of the work: the probability of job loss and the cost of job loss.

An alternative to the above formulation is the use of a probabilistic question, which is to ask individuals about the probability of losing their jobs. Here is how a typical formulation would be:

"What do you think is the likelihood that you will lose your job over the next 12 months?"

The use of probabilistic questions is supported in some recent contributions (Manski and Straub, 2000) because they are more robust to interpretation issues.

Dickerson and Green (2012) have furthermore demonstrated the higher predictive power of such probabilistic questions and with regard to individuals' ability to provide useful information in their responses to questions regarding their expectations of future job loss. Moreover, cardinal scales offer analytical advantages, in that marginal changes in probability are commensurate along the scale, which is not true of ordinal verbal descriptors. Finally, in the analysis of expectations and realisations establishes it is better to use cardinal rather than ordinal scales because the meaning of numerical scale points is unambiguous while that of verbal descriptors might differ among respondents if their understanding of language is heterogeneous or if the words are vague.

3. Data and measures of job insecurity

Our individual-level analysis, covering all the Swiss Cantons, has been realized using the data collected by the Swiss Household Panel (SHP), which is based at the Swiss Centre of Expertise in the Social Sciences FORS. The Swiss National Science Foundation finances this project.

The data have been collected since 1999 through annually repeated surveys of households and individuals and the interdisciplinary and longitudinal study is well suited for representative analyses of the Swiss residential population. In addition to the traditional variables found in national household surveys (demographic characteristics, income, health, housing), the SHP contains a series of questions on personal relationships and activities outside working, as well as a number of satisfaction questions. Included in the latter there are question on satisfaction with job (in)security. According to the literature reported in Chapter 2, we studied both procedures mentioned above of eliciting job insecurity perceptions (Linz and Semykina, 2008; Dominitz and Manski, 1997; Elman and O'Rand, 2002):

- degree of satisfaction with job security (*job ins*);
- probability of losing job (*job loss*).

Two SHP questions included in each survey round address these issues:

- "Would you say that your job is very secure, quite secure, a bit insecure or very insecure?" (*job ins*);

- "How do you evaluate the risk of becoming personally unemployed in the next 12 months, if 0 means "no risk at all" and 10 "a real risk"?" (*job loss*).

In the first case, respondents were given a verbal scale, “very secure”, “quite secure”, “a bit insecure” or “very insecure”.

In the second case, respondents were given an 11-point Likert scale, where 0 reflected a positive assessment (confidence - "no risk at all") and 10 reflected a negative assessment (fear - "a real risk"). The variable is recoded for the econometric analysis, such that it takes the value of 1 if people are not concerned at all about their job security, 2 if they are fairly concerned, 3 if they are concerned and 4 if they are very concerned.

Substantial similarities between the SHP questions and questions cited in the literature on developed market economies facilitate the comparison of our results with those of other studies.

Our sample was restricted to the civilian workforce, aged 15- 65: the size of the resulting sample is 10,879 observations.

The SHP provides individual and job-specific control variables: we selected the set of explanatory variables according to previous studies that have defined the determinants of job insecurity perceptions (Linz and Semykina, 2008; Clark and Postel-Vinay, 2005; Green et al. 2000; Manski and Straub 2000; Näswall and De Witte 2003; Nickell et al. 2002). Individual-specific control variables are gender, which distinguishes between male and female employees, marital status, between married and not married workers, presence of children in the household, education, defined on three levels, nationality, between Swiss citizens and foreigners, and age, measured in years.

With respect to job-specific attributes, the control variables include the wage, the type of employment, and a public service indicator. Full-time and part-time constitute a dummy variable set, such that each worker can be assigned to one of these categories at any point of time. Fixed-term and temporary work, constitute a separate dummy set. These variables capture possible increases in job insecurity due to an expansion of non-standard jobs in the market (Garz, 2012).

In order to allow for the possibility that the contribution of different factors to perceptions of job insecurity varied over time we perform estimation separately for two years: the period of relative stability, before the declining of the economy (2008) and the period of major economic uncertainty, after the economic downturn (2011). We provide summary statistics for the samples used in particular descriptive and regression analyses in Table 1.

[Insert Table 1 about here]

At first we analyse economic insecurity examining unconditional effects: on the average, only 10% of the workers expressed concerns about *job ins*, both in 2008 and in 2001, while at the contrary *job loss* was 17,9% in 2008 and 18,4% in 2011.

The same situation holds for gender differences in perceptions of job insecurity: data show a large gender difference considering *job loss* as insecurity measure.

Workers with university education and those who have higher education are more likely to perceive their jobs as secure.

According to literature, finally, *job loss* tend to increase with age up to the point when workers reach retirement age, and decline afterward. In contrast, *job ins* increases monotonically with age. Considering occupational differences data confirm results found in previous studies (Linz and Semykina, 2008; Clark and Postel-Vinay, 2005). Occupations associated with state sector employment have low perceptions of job insecurity, and the insecurity, as expected, declines over the course of the considered period. In fact, their jobs are more secure than a private job in a downturn period. The least concerned about their economic situation are nevertheless supervisors and managers.

Regarding differences in local labour market conditions, perceptions of job insecurity are positively related: workers living in areas with better labour market outcomes (North Western Switzerland) are less likely to feel

insecure than workers living in other regions, especially in border regions. A remarkable result is that workers residing in Ticino showed in 2008 low levels of insecurity, while in 2011 they were the most concerned workers in Switzerland, maybe because of a displacement fear (Angrist, and Kugler, 2002). In fact, in the considered period the number of economically active foreign nationals in Ticino reached the 25% of active population, the highest value in Switzerland.

Workers living in small town were relatively optimistic about their job security than workers living in metropolitan areas during the considered period.

[Insert Table 2 about here]

4. Regression results: perceptions of job insecurity in Switzerland

To account for the ordered categorical character of the dependent variables, we used ordered probit regressions, with our two measures of job insecurity (*job ins* and *job loss*):

$$y^*_i = \beta_1 \boldsymbol{IS}_i + \beta_2 \boldsymbol{JS}_i + \mu_i + \varepsilon_i \qquad (1)$$

where i denotes individuals i, $i = 1 \ldots N$. The latent dependent variable y^* is perceived job insecurity, $\boldsymbol{IS}$ contains individual-specific regressors and $\boldsymbol{JS}$ refers to job specific regressors. The errors ε are assumed logistically distributed and independent across individuals for given values of the regressors and the random intercept.

We perform estimation separately for 2008 and 2011, using, in our regression analysis, cross-sectional estimation techniques. For each dependent variable, the lowest value of the measure reflects the most favourable outcome (security-confidence) and the highest value reflects the most adverse outcome (insecurity-fear).

Table 3 presents the estimation results from Ordered Probit regressions of perceived job security on the set of controls that we described in the previous paragraph.

[Insert Table 3 about here]

First, we expected temporary workers to be most responsive in terms of job insecurity as temporary jobs are more exposed to the risk of job loss. Effectively for temporary workers there is a sensible job security difference, being the coefficient for this category of workers positive and strongly significant. Coefficients for 2011, both for *job loss* and *job ins* are lower than coefficients for 2008; this could be interpreted to reflect the generally less favourable conditions in the labour market in 2011, and a general higher "feeling" of job insecurity.

4.1 Age

Partly according to the descriptive analysis, but in contrast with what is often found in the analysis of subjective well-being measures (Clark, 1996), we do not clearly find that job security, expressed both as *job loss* or *job ins*, is decreasing and convex (U-shaped) in age.

4.2 Education

Education seems to play only a small role in terms of job security. For 2008, only the coefficient for *job ins* of low educated workers is positive and significant: in 2008 the economic downturn, in effect, concerned only the financial sector. This, as discussed before, may be also taken to reflect the fact that this formulation makes the interpretation of the resulting measurement of the job insecurity problematic because of it confuses the perception of the respondent in the probability of job loss and the cost of job loss.

4.3 Gender and marital status

The point estimate for married workers is negative, but statistically significant only in 2008. Hence, there is some mitigated evidence that married workers felt less secure than single workers do before the economic downturn. As in previous studies (Clark and Postel-Vinay, 2005) neither cohabitation nor the presence of children in the household affect job security in any systematic way, both in case of married or non-married couples.

In both regressions for 2008 and 2011, perceptions of job insecurity are lower among women in 2008 and higher in 2011 but not significant. These findings are partly in line with patterns observed in other developed economies, where gender differences in perceptions of job insecurity were found to be negligible (Elman and O'Rand, 2002). When job insecurity is measured by *job loss*, gender differences in perceptions are higher and significant for 2008. This result is striking: one would expect, according to literature, being a female should reduce perceived job security. A possible interpretation here is that this is due to the high female participation rate in Switzerland.

4.4 Region, unemployment and foreigners rate

Once we control for other factors, we can see a clear relationship between perceptions and region of residence. Perceptions of job insecurity tend to be higher among workers in regions characterized by better labour market outcomes. Moreover, there is evidence that foreign-born workers feel more insecure than natives do, as discussed by Green et al. (2000) and Clark and Postel-Vinay (2005).

Nevertheless, as one would expect, the average local unemployment rate or foreign rate should reduce perceived job security: the effect is positive but insignificant.

In 2011, therefore, the negative impact of the region of residence on *job loss* is rather high and significant at the 1% level, indicating that during the period of substantial uncertainty, workers were roughly equally

concerned about a chance of losing their jobs, regardless of whether the unemployment rate was high or low.

Among workers residing in small towns, perceptions of *job loss* were relatively high in 2008 but decreased in 2011: urban-rural differences diminished over time.

4.5 Comments

Our results are in general consistent with findings based on data collected in European economies and they seem to match reality fairly well. In Europe, according to the fifth European survey into working conditions (2010), workers felt secure until 2008, and then the job insecurity started to rise in almost all the European countries.

Since then, with the progressive deterioration of macroeconomic conditions, workers' views of their own job situation are rather pessimistic and perceptions of job security are higher in countries where employment opportunities are scarcer.

The substantial concern among older workers in 2011 about finding a new job is similar to results reported in studies conducted in developed market economies and is consistent with the fact that, in the Swiss labour market, as in the US market, unemployment spells tend to be longer among older workers (Neumark and Button, 2014).

Finally, the statistical non-significance of the average local unemployment rate or foreign rate on job security, versus the significant effect of the coefficient of the region of residence, shows a simple correlation. Perceptions on the local unemployment are included in a general perception of the socio-demographic background of employees, caught by the regional coefficient. As discussed by Graf (2008), "media effects" (the general media coverage of labour market policy) could affect individual perceptions of job insecurity.

Moreover, a rise in perceptions of job security (measured as *job ins*) over time among Swiss would suggest that workers are biased in the assessments they make of their own job security. Our results seem to

confirm the necessity to use cardinal rather than ordinal scales (Dickerson and Green, 2012). Verbal descriptors might differ among respondents if their understanding of language is heterogeneous or if the words are vague while the meaning of numerical scale points is unambiguous; cardinal scales are consequently preferable.

Nevertheless, it is an open question as to whether the responses on cardinal scales in practice can capture valid representations of what workers expect, given that not all respondents can show a perfect understanding of the questions.

5. Conclusions

We examined perceptions of economic insecurity in Switzerland, during the business cycle between 2008 and 2011. We find that perceptions of Swiss workers are similar to those obtained from studies conducted in other European economies: perceptions of job security tend to be higher among workers with supervisory responsibilities, among permanent workers and among workers who live in regions that are not adversely affected by economic conditions. Perceived job security in non-public sector jobs is lower than in public sector jobs, which seem to be more "universally" perceived as safe jobs and protected from labour market shocks.

Unlike previous studies, however, we find that perceptions do not strongly differ between workers with different levels of education and age is not strictly positively correlated with confidence in keeping one's current job.

Workers perceptions are consistent with actual labour market conditions: due to the good performance of the Swiss labour market, the overall feeling of job insecurity appear to be less prevalent in Switzerland than in the rest of Europe. However, perceptions of economic security were very high in years of economic stability (until 2008), and deteriorated after the period of major uncertainty (2011). In both periods, workers with

relatively weak positions in the labour market tended to have higher perceptions of job insecurity.

The findings have important implications from a theoretical perspective and from a policy perspective.

From a theoretical point of view, this study contributes to the literature by studying important variables that help to explain the formation of job insecurity perceptions. The findings emphasize the need to critically question rationality assumptions in many economic models, especially if these models involve perceptions or expectations (Dickerson and Green, 2012).

Policy makers should be aware that policy-specific information is processed with a bias; otherwise, policies may have unanticipated economic consequences.

Further research is necessary to investigate other important aspects of the job security-perceptions relationship. In particular, it seems potentially valuable to assess the longitudinal dimension of the data to try to account for selection problems. Moreover, it may be the case that the level of job protection and the level of job insecurity are driving factors into the overall worker's job satisfaction.

Figure 1 - Fear of losing one's job and job satisfaction*.

***Data refer to 2005 and 2010 for European Union countries and Switzerland. The figure presents the percentage on the active occupied saying that they are "concerned or very concerned" about their job security or "satisfied or very satisfied" with their job.**

Source: Fifth European Working Conditions survey - 2010.

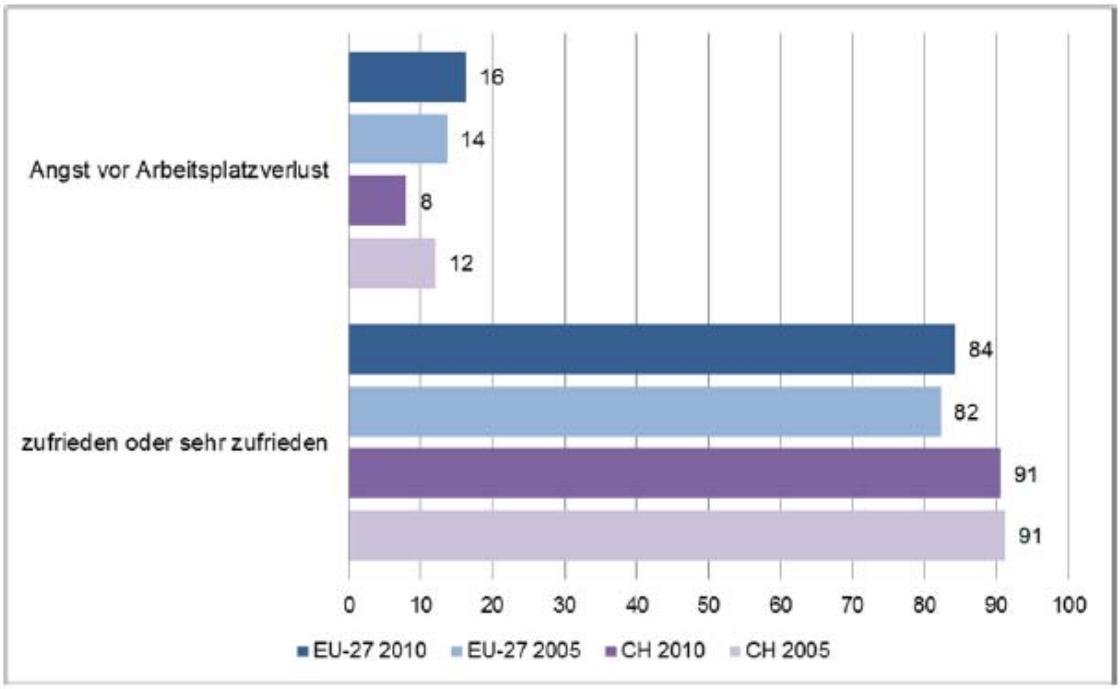

Table 1 - Descriptive statistics

Variable	Description	Mean	Std. Dev.	Mean	Std. Dev.
		2008		2011	
Individual and local characteristics					
age	Age (continuous)	40.04155	21.9758	41.62218	22.46824
age2	Squared age (continuous)	2086.217	1837.029	2237.182	1926.938
female	1 if female	0.5161172	0.4997631	0.518519	0.499679
married	1 if married	0.4620474	0.4985804	0.465539	0.498833
children	1 if not-married couple with children	0.0126803	0.1118959	0.018109	0.13335
marchildren	1 if married couple with children	0.4989433	0.5000219	0.473599	0.499325
young	1 if age<31	0.3586727	0.4796329	0.34846	0.476504
middleaged	1 if age>31 & age<50	0.2932255	0.4552618	0.26647	0.442133
older	1 if age>50	0.3481018	0.4763904	0.38507	0.486634
swiss	1 if Swiss citizen	0.8896755	0.3133082	0.897592	0.303198
eduinf	1 if primary educaton	0.2997132	0.458155	0.28287	0.450415
edumid	1 if apprenticeship, full-time vocational school	0.5136952	0.4998371	0.517721	0.49971
edusup	1 if high school, university	0.1865915	0.3896025	0.199409	0.399575
small_town	1 if 1 if lives in small or middle sized town	0.0815502	0.2736908	0.084273	0.277809
large_town	1 if 1 if lives in large town	0.1882634	0.3909403	0.187422	0.390267
Job characteristics					
lowinc	1 if low income	0.3665005	0.481903	0.343104	0.474796
midinc	1 if medium income	0.1946179	0.3959489	0.194472	0.395834
highinc	1 if high income	0.3705134	0.4829971	0.398183	0.489575
temporary	1 if temporary job	0.1379915	0.3449342	0.135625	0.342429
parttime	1 if part-time job	0.4709241	0.4992067	0.48856	0.499918
proftrain	1 if doing professional training	0.2952797	0.4562083	0.270121	0.444057
public	1 if public sector job	0.3914286	0.4881333	0.387183	0.487165
professional	1 if professionals	0.1685297	0.3743762	0.167367	0.37334
hightech	1 if higher supervisory/technicians	0.2416165	0.4281091	0.238952	0.426486
desk	1 if intermediate occupations	0.1958298	0.3968807	0.196961	0.397742
self	1 if self employed	0.0694325	0.2542155	0.065987	0.248284
lowtech	1 if lower supervisors and technicians	0.0214961	0.1450468	0.022596	0.148625
service	1 if lower sales and service	0.11135	0.3145988	0.119176	0.324028
technical	1 if lower technical	0.1003869	0.3005475	0.097181	0.296233
routine	1 if routine job	0.0913586	0.2881493	0.091782	0.288746
Region of residence					
r1	1 if Lake Geneva (VD, VS, GE)	0.1757737	0.380645	0.177223	0.381875

Variable	Description	Mean	Std. Dev.	Mean	Std. Dev.
		2008		2011	
r2	1 if Middleland (BE, FR, SO, NE, JU)	0.2420792	0.4283616	0.248703	0.432281
r3	1 if North-west Switzerland (BS, BL, AG)	0.142621	0.349702	0.141886	0.348949
r4	1 if Zurich	0.1762329	0.3810357	0.16613	0.372214
r5	1 if East Switzerland (GL, SH, AR, AI, SG, GR, TG)	0.1301313	0.3364633	0.126677	0.332626
r6	1 if Central Switzerland (LU, UR, SZ, OW, NW, ZG)	0.0970704	0.2960673	0.099302	0.299081
r7	1 if Ticino	0.0360915	0.1865263	0.040079	0.196153
Political party					
left	1 if left	0.2433657	0.4291487	0.245611	0.430482
centre	1 if centre	0.5639159	0.4959381	0.536341	0.498716
right	1 if right	0.0957929	0.2943308	0.111488	0.314759
Macroeconomic condition					
for	Local foreing rate	21.45856	6.092793	22.51885	6.306033
un	Local unemployment rate	2.569419	.9933502	3.151235	1.188648

Table 2 - Percent of workers who feel most vulnerable, by period

	Description	Concerned about a chance of losing job[1]		Concerned about job security[2]	
		2008	2011	2008	2011
Overall		17.94	18.4	10	9.22
female	-	18.12	19.22	10.28	9.74
male	-	17.75	17.5	9.7	8.65
married	married	17.74	18.1	9.5	9.52
children	1 if not-married couple with children	22	13.33	18.36	7.69
marchildren	1 if married couple with children	17.46	18.02	8.98	8.78
young	age<31	18.61	16.68	8.85	5.49
middleaged	age>31 & age<50	19.1	19.61	9.95	9.71
older	age>50	15.67	18.01	11.47	11.15
eduinf	primary educaton	18.58	19.7	8.53	8.31
edumid	apprenticeship, full-time vocational school	18.77	19.85	6.37	8.66
edusup	high school, university	15.35	14.44	12.18	10.72
small_town	lives in small or middle sized town	20.7	17.84	11.02	7.99
large_town	lives in large town	17.83	20.86	11.38	10.33
lowinc	low income	21.28	20.29	12.34	11.07
midinc	medium income	17.91	21.19	9.57	10.12
highinc	high income	15.58	16.56	8.48	8.77
public	public sector job	14.55	13.87	9.31	8.61
temporary	temporary job	20.81	19.37	15.72	14.2
parttime	part-time job	19.07	18.94	11.29	10.54
professional	professionals	13.96	16.19	10.45	9.92
hightech	higher supervisory/technicians	16.37	16.25	10.97	10.05
desk	intermediate occupations	17.15	18.02	8.45	7.69
self	self employed	15.15	15.85	13.77	15.33
lowtech	lower supervisors and technicians	12.95	18.79	7.29	6.6
service	lower sales and service	21.24	19.46	8.42	7.52
technical	lower technical	18.08	17.08	9.33	8.98
routine	routine job	19.32	22.47	11.35	7.98
r1	Lake Geneva (VD, VS, GE)	24.48	23.42	10.22	8.72
r2	Middleland (BE, FR, SO, NE, JU)	16.69	17.84	8.09	6.62

	Description	Concerned about a chance of losing job[1]		Concerned about job security[2]	
		2008	2011	2008	2011
r3	North-west Switzerland (BS, BL, AG)	17.06	17.7	13.36	10.81
r4	Zurich	18.06	20.16	12.88	12.14
r5	East Switzerland (GL, SH, AR, AI, SG, GR, TG)	13.97	13.94	7.84	6.94
r6	Central Switzerland (LU, UR, SZ, OW, NW, ZG)	17.61	14.1	8.84	11.26
r7	Ticino	14.16	23.49	3.51	11.33
left	left	20.45	10.97	19.52	9.91
centre	centre	18.01	9.85	19.65	9.41
right	right	18.84	10.01	19.66	7.51

[1] Respondents were included in this group if said they were “concerned” or “very concerned.
[2] Respondents were included in this group if said they were “a bit insecure” or “very insecure”.
(See Par. 2)

Table 3 – Ordered probit estimates for degree of satisfaction with job security (*job ins*) and probability of losing job (*job loss*), by period

	Concerned about a chance of losing job (*job loss*)		Concerned about job security (*job ins*)	
	2008	2011	2008	2011
age	0.089***	0.093***	0.126***	0.117***
	[0.025]	[0.022]	[0.024]	[0.021]
age2	-0.001***	-0.001***	-0.001***	-0.001***
	[0.000]	[0.000]	[0.000]	[0.000]
female	-0.113*	0.046	-0.097	0.025
	[0.064]	[0.061]	[0.065]	[0.063]
married	-0.216***	-0.022	-0.175***	-0.064
	[0.069]	[0.064]	[0.066]	[0.065]
children	-0.042	-0.205	0.085	-0.329*
	[0.186]	[0.173]	[0.202]	[0.175]
marchildren	0.055	0.024	0.069	0.007
	[0.064]	[0.059]	[0.062]	[0.060]
young	0.090	-0.044	0.228*	-0.036
	[0.125]	[0.125]	[0.129]	[0.132]
older	0.144	0.094	0.074	0.205**
	[0.103]	[0.088]	[0.095]	[0.087]
swiss	-0.119	-0.164**	-0.153*	-0.101
	[0.081]	[0.079]	[0.083]	[0.077]
eduinf	0.111	0.087	0.155	0.255***
	[0.105]	[0.100]	[0.101]	[0.092]
edusup	-0.089	-0.067	0.053	0.004
	[0.060]	[0.058]	[0.061]	[0.060]
small_town	0.277***	0.064	0.248***	0.068
	[0.085]	[0.087]	[0.088]	[0.079]
large_town	0.018	0.008	-0.005	0.068
	[0.062]	[0.060]	[0.061]	[0.059]
lowinc	0.363***	-0.039	0.209***	0.015
	[0.073]	[0.074]	[0.074]	[0.073]
highinc	0.043	-0.169**	-0.074	-0.087
	[0.068]	[0.067]	[0.066]	[0.066]
temporary	0.987***	0.595***	0.965***	0.793***
	[0.105]	[0.105]	[0.117]	[0.114]
parttime	-0.145**	-0.235***	-0.104	-0.063
	[0.065]	[0.064]	[0.066]	[0.066]
proftrain	-0.006	-0.064	-0.022	-0.066
	[0.048]	[0.048]	[0.049]	[0.048]
public	-0.465***	-0.460***	-0.340***	-0.436***
	[0.054]	[0.051]	[0.051]	[0.050]
professional	0.187*	0.012	0.115	0.123
	[0.112]	[0.107]	[0.113]	[0.104]
hightech	0.252**	-0.116	0.132	0.054
	[0.103]	[0.100]	[0.104]	[0.093]
desk	0.217**	-0.014	0.084	0.088
	[0.102]	[0.098]	[0.103]	[0.092]
lowtech	-0.221	0.017	-0.154	0.005
	[0.214]	[0.161]	[0.186]	[0.156]
service	0.246**	-0.048	0.017	0.124
	[0.110]	[0.107]	[0.109]	[0.097]

	Concerned about a chance of losing job (*job loss*)		Concerned about job security *(job ins*)	
	2008	2011	2008	2011
technical	0.192	-0.105	0.191	0.158
	[0.118]	[0.112]	[0.118]	[0.107]
left	0.042	-0.034	0.052	-0.056
	[0.055]	[0.053]	[0.054]	[0.055]
right	-0.101	-0.098	-0.062	-0.115
	[0.099]	[0.087]	[0.094]	[0.080]
r1	-0.057	-0.116	-0.323**	-0.264**
	[0.136]	[0.105]	[0.135]	[0.106]
r2	-0.102	-0.194**	-0.146	-0.175*
	[0.107]	[0.091]	[0.107]	[0.093]
r3	-0.100	-0.263***	0.064	-0.044
	[0.085]	[0.080]	[0.085]	[0.081]
r5	-0.139	-0.289***	-0.086	-0.150*
	[0.091]	[0.092]	[0.091]	[0.088]
r6	-0.102	-0.213**	-0.090	-0.018
	[0.102]	[0.096]	[0.102]	[0.097]
r7	-0.248	-0.390**	-0.431**	-0.098
	[0.220]	[0.175]	[0.216]	[0.169]
for	-0.008	-0.004	0.002	0.004
	[0.013]	[0.010]	[0.013]	[0.010]
un	0.078	0.063	0.020	-0.005
	[0.100]	[0.058]	[0.099]	[0.058]
Observations	2,508	2,702	2,515	2,712

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Refercence categories: workers with no higher education, age>31 & age<50, routine job, medium income, Zurich region

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Chapter 2

Job satisfaction, flexibility and security: evidence from Swiss individual-level data

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Abstract

The effects on employment of the recent economic crisis have become evident and persistent in many OECD countries, exacerbating on the one hand the demand for more flexibility by the firms – with subsequent frequent transitions between employment and unemployment – , on the other the need to ensure workers security. "Flexicurity", an institutional frame which couples firms flexibility with workers' security, has been defined as a successful model at the EU level before the crisis.

The objective of this paper is therefore to empirically assess the effect of a micro-level measure of flexicurity on workers' job satisfaction over the business cycle using individual-level data from the longitudinal Swiss Household Panel (SHP), related to temporary and permanent employees in Switzerland for the period 2005 to 2011. Switzerland provides a particularly appropriate market to examine the potential effects of flexicurity type arrangements due to the relatively high incidence of flexible employment contracts. To this end, the sample of workers is disaggregated into different groups according to their employment contract (permanent or temporary) and their perceived job security; we therefore analyse whether workers who are heterogeneous in terms of both the type of labour contract and their perceived security do also differ with regard to life satisfaction and specific aspects of the job satisfaction. Usually satisfaction variables, given the ordinal nature of the dependent variable, are analysed using ordered probit models. Van Praag and Ferrer-i-Carbonell (2006), however, developed a procedure, called Probit OLS or POLS, that consists in transforming an ordinal dependent variable in a "pseudo" continuous one, and allows the application of a linear model. With longitudinal data the POLS method permits for the inclusion of individual level fixed or random effects, wich are not always easily implementable with non linear and ordered models. Our methodology estimates a linear fixed effects model, thus controlling for unobserved time-invariant characteristics. We also extend our analysis and

seek to identify how insecurity affects temporary workers compared to permanent workers examining the impact of regional labour market conditions: we examine the effects on relative satisfaction and perceptions of security on workers in the seven Swiss statistical regions.

Our results show that job stability and perceived security are not necessarily associated, and that job satisfaction is relatively low, mainly when perceived job security is low. The relationship between wellbeing and job security also varies according to regional employment conditions. This indicates that the duration of the contract may be less important if the worker perceives that he is not at risk of unemployment; in this regard, from a point of view of policy, a greater "flexicurity" can be obtained either directly from employer, adopting changes in work organization, or indirectly by policy makers through an appropriate mix of active labour market policies.

JEL codes: J28, J81

Keywords: job satisfaction, Flexicurity, unobserved heterogeneity

1. Introduction

Over the last couple of decades, because of the intensification of competitiveness due to market globalization together with the spread of new Information and Communication Technologies (ICT), policy makers have been trying to enhance the flexibility and improve the performance of European labour markets through the application of extensive labour market reforms. An aspect of these reforms has been the simplification of the restrictions regulating the use of temporary employment contracts (OECD, 2006) and the wide spreading of temporary work and so-called flexible contracts such as fixed-term contracts, seasonal jobs and temporary agency work. After a first period of increasing feeling of insecurity, during the '90 it decreased, although with important differences between European countries (Auer and Cazes, 2003). In spite of the economic and institutional differences, these countries have the same main problem: how to promote sustainable economic growth, which entails maintaining bigh competitiveness also through flexibility without harming workers employment and income security, which may cause poverty and social exclusion.

Moreover, the effects on employment of the recent economic crisis have become evident and persistent in many OECD countries, exacerbating on the one hand the demand for more flexibility by the firms – with subsequent frequent transitions between employment and unemployment –, on the other the need to ensure workers security.

During the last years, indeed, the number of non-permanent forms of employment, as fixed-term employment and temporary agency work, has enormously increased resulting in a substantial relative growth in "flexible" employment. In response to the crisis, at the EU level, "Flexicurity", an institutional frame implementing a progressive flexibility of the labour market and at the same time guaranteeing its stability, has been defined as a popular model.

[Insert Figure 2 and 3 about here]

The objective of this paper is therefore to empirically assess the effect of a micro-level measure of flexicurity on workers' job satisfaction in Switzerland. Job satisfaction will be considered as a cognitive factor, as the extent of the individual's satisfaction with particular aspects of his job: our focus on estimating the joint effect of fixed-term employment and institutional context on job satisfaction is associated with the estimation of different socio-economic variables. We consider both the type of contract (permanent or temporary) and the perceived security, measured by asking individuals about the probability that they assign to losing their jobs.

2. Background

In principle, temporary employment can have both positive and negative welfare consequences for workers. A flexible scheduling arrangement and other aspects of the daily work experience related to temporary work, indeed, may be valued and preferred by some employees, whereas the insecurity and poorer working conditions associated with these contract types can have a negative impact on workers' welfare (Blanchard and Landier, 2002). Employment stability is instead desirable both for workers, who rank it as one of the most important factors for job satisfaction (European Commission, 2001), and for firms, which dislike high turnover and prefer stable employment relationships in order to retain human capital investment and reduce both workforce screening and selection costs. On the other hand, the recent intensification of competitive pressures has called for more flexibility in labour markets for both firms and workers.

Since the '70, psychologists and sociologists have been extensively analyzing "job satisfaction" (wich can be defined as a subjective measure of how people feel about their job), and starting from Hamermesh (1977) and

Freeman (1978) this variable has been also recognized as an important economic variable in order to describe the economic life and the personal behavior in the labour market. According to recent economic literature, job satisfaction, wich can be thought as a multidimensional construct involving subjective aspirations and objective opportunities, is important for at least two reasons: it increases the productivity of labour and therefore the productivity of firms and it can improve overall social well-being, being closely related to individual happiness and well-being (Bruno, Caroleo and Dessy, 2013).

A growing number of studies have investigated the determinants and consequences of differences in individuals' reported job satisfaction. Research in psychology and sociology has emphasized that job satisfaction depends not only on the remuneration for the job but also on other workplace characteristics like career prospects, job security, job content, autonomy at work, and interpersonal relationships. Most of the studies in this strand of research show that job security and job content are the most influential determinants when it comes to explaining job satisfaction (D'Addio et al., 2007, De Cuyper et al., 2009).

Seeing the economic dimension of job satisfaction, it should be considered as a utility function, and it should depend on salary or income and then decrease in working hours (Clark and Oswald, 1996), all other things being equal. In this case, the lower wage of temporary workers shoud imply that they are discounting the cost of filling the job experience or skills gap and the cost of the time needed to gather information in a search for the best match. Therefore, the lower satisfaction of temporary workers, found in most of the empirical research, should be the motivation driving them towards stable employment, which is ranked as one of the most important factors of satisfaction (European Commission, 2001). It could be even linked to occupations and jobs that will ensure the best correspondence between the ability of a worker and professional requirements (Eurofound, 2007).

Several studies have consequently looked at the effect of temporary contracts on job satisfaction examining the relation between job satisfaction

of workers with fixed-term contracts; the evidence is instead mixed. Bardasi and Francesconi (2000), De Graaf-Zijl (2012) and De Witte and Naswall (2003) find a negative impact only for specific forms of temporary employment, especially for temporary work and seasonal jobs, or for aspects regarding job stability. To the contrary, they do not find a significant difference in overall job satisfaction between permanent and temporary workers.

While some studies do not show statistically significant differences in job satisfaction between workers in permanent jobs and those with fixed-term contracts (D'Addio et al., 2007, Bardasi and Francesconi, 2004), others find significantly lower job satisfaction among fixed-term workers (Booth et al., 2002, Clark and Oswald, 1996, Petrongolo, 2004). De Graaf-Zijl (2008) and Green and Heywood (2007) in addition look at the job satisfaction of temporary agency workers in the Netherlands and the UK, respectively. Both studies indicate that agency workers are significantly less satisfied with their jobs compared to workers with other types of contracts. Green and Heywood (2007) to some extent confirm the results of De Graaf-Zijl (2008) for the UK, finding that, after controlling for satisfaction with several different job characteristics, flexible workers are more satisfied, and arguing that, although flexible contracts provide less satisfaction with job security, other aspects of the job compensate so that overall satisfaction appears similar. Interestingly, they find indeed that flexible workers are generally even more satisfied with their remuneration, working time, and work content than permanent workers. However, in contrast to the Dutch findings, they show that satisfaction with job security is the main determinant of overall job satisfaction. Using the Eurobarometer, Origo and Pagani (2009), by measuring flexibility through the type of contract and security through perceived job security, show that, in countries with generous unemployment insurance systems, fixed-term workers are not significantly less satisfied with their jobs.

Beckmann et al. (2007) provide evidence that fixed-term workers in Germany might be even more satisfied with their jobs.

Using the European Community Household Panel (ECHP) for the period 1995-2001, Salvatori (2010) analyzes how changes in restrictions on the use of temporary employment contracts affect job satisfaction identifying a negative effect on the well-being of all workers when regulations on temporary work contracts are tightened. As for fixed-term workers, his results indicate that job satisfaction increases when restrictions on the use of flexible employment forms are loosened. The reason might be that stricter regulations on temporary employment cause the labour market to deteriorate. Consequently, the job-finding rate for workers who are at risk of losing their jobs declines and their job satisfaction decreases. However, as soon as he includes country-specific time trends, the results lose any significance.

Finally, Theodossiou and Vasileiou (2007) study the relationship between job satisfaction and job security measured in terms of unemployment expectations. After controlling for the potential endogeneity of the job satisfaction-job security relationship, they find that higher job security is linked to higher job satisfaction. However, they do not consider the effect of the type of contract.

The main important issue, regarding this strand of the research is therefore to determine what factors influence the perception of security in the workplace and its impact on the welfare of workers. A first hypothesis concern how the macroeconomic environment interact with the implemented policies and the overall functioning of the labour market. Some recent studies have considered the impacts of employment protection legislation (EPL) and unemployment benefit (UB), used alternatively to reduce the risk of unemployment. However, results are diversified. Postel-Vinay and Saint Martin (2007) and European Commission (2007) find that UB work better than EPL in promoting job security, arguing that stricter EPL for permanent workers encourages the growth of flexibility “at the margin” (Boeri and Garibaldi, 2007; Boeri et al., 2012). In countries with higher EPL workers may feel more insecure because they cannot count on the safety net provided by UB if they lose their jobs. In contrast, in countries with low EPL

and high UB active labor market policies (flexicurity scheme), even temporary workers can feel confident and happy with their jobs.

In summary, the economic literature identifies two different relationships between job security and flexibility:

- the "trade-off" theory, which implies a negative relationship between flexibility and security. According to this hypothesis a high level of job security can only be achieved at the cost of poor flexibility and flexible employment patterns are in conflict with job security;
- the "flexicurity" approach, which instead assumes that flexibility and security are not contradictions, but they can be mutually supportive, with the implementation of the right labour market policy.

The flexicurity model has been initially implemented in Denmark and in The Netherlands combining active labour market policies, mainly focused on active job search and training, with low employment protection legislation (numerical flexibility) and a generous system of unemployment benefits (social security). Consequently, the main idea behind flexicurity is to achieve a shift from job security (same job for his-her entire working life) to the employment security, which is having the possibility of permanent employment.

More in general, there are still few micro econometric studies showing the joint effect of perceived job security and the type of contract on job satisfaction.

3. The Swiss case

In this regard, it is of particular interest to look at the experience of Switzerland, wich is a federal republic consisting of 26 regions (cantons). It has currently about 8.036 million inhabitants, corresponding to a population density of about 191 people per km^2 despite the country's mountainous character; about three quarters of the population live in urban areas. The native language of about 66% of the population is German, 23% French and 8% Italian. Based on the original 1874 Constitution, political institutions

have been characterised by considerable stability and consensus-building, with a government coalition traditionally formed by the four biggest parties. The legislative process is largely decentralised, with a strong role given to the cantons and to elements of direct democracy. Switzerland has a long tradition of neutrality, and is one of the few remaining members of the European Free Trade Association (EFTA), rather than the European Union, although the latter accounts for most of its foreign trade; only in 2002 did the country join the United Nations.

For this reason, there is large regional variation in Switzerland, concerning financial capacity, employment patterns, unemployment levels and welfare dependency. For example, per-capita income in the canton of Basel-City, the highest in Switzerland, is more than twice that of the canton of Obwalden. In general, the southwestern (French and Italian-speaking) cantons show less advantageous labour market outcomes than their German-speaking counterparts.

Over the past three decades, the Swiss labour force has grown from about 3 million to 4.8 million people. In most respects, the labour market has performed above average: compared to other OECD countries the Swiss labour market is therefore characterised by high employment rates, low unemployment and high wage levels. The main factors underlying this good performance are normally considered to be a high degree of labour market flexibility, with decentralised wage bargaining and relatively low employment protection regulations, supported by a strong focus (at least since the mid-1990s) on active labour market policies and employment services characterised by strong "mutual-obligation" principles. Another feature of labour market performance has been the design of immigration policies, which in the past implied the use of immigrant labour as a labour supply reserve that left the country in times of economic hardship (see OECD, 2013; Gerfin, 2007).

Hovewever, Switzerland has not escaped the global economic downturn starting in 2008. GDP growth became negative in the second half of the year, and stayed negative in 2009; economic growth then resumed

strongly in 2010. The impact of the recession on the labour market, at first relatively modest, nevertheless led to a 30% rise in unemployment, from 3.5% in 2008 to 4.4% in 2009, and only recently it has been starting going down (4.1% in 2013 - last quarter).

Although already at a high level, female employment has kept growing since the mid-1990s, and recent labour force growth is almost entirely due to women. At almost 61.2% in 2012, female employment was a full 6 points above the OECD average (although still behind levels in Nordic countries).

The high share of part time in total employment (26.0% in 2012, compared with an OECD average of 16.9%) plays some role in explaining the high Swiss female employment rate. In fact, adjusted for hours worked, female employment would only be at a mid-field position among OECD countries. The share of temporary among total employment was 13% in 2013, slightly above the OECD average (12%), with high regional etherogeneity.

As can be expected, the evolution of sectoral employment shares reflects the advanced tertiarisation of the economy. The transit from an industrial to a service economy implied an important change of the sector of employment of the working population in the industrial sector. Even if the employment rate in the service sector rose considerably (from 39% to 73,7% in 2011), compared to other European States, Switzerland has still a high employment ratio in different sectors and a high level of employment in manufacturing branches.

4. Data and descriptive analysis

Our analysis is based on individual-level data from the longitudinal Swiss Household Panel (SHP)[1], related to temporary and permanent employees in Switzerland for the period 2005 to 2011. The panel offers

[1] The Swiss Household Panel (SHP) is based at the Swiss Centre of Expertise in the Social Sciences FORS. The project is financed by the Swiss National Science Foundation.

information on individuals living in all the Swiss cantons and the SHP questionnaires cover a wide range of subjects (as employment status and working conditions, occupational and family biographies and personality traits, education, training and social security).

A first reason using Swiss figures is the availability of high-quality panel data: 14 waves of the Swiss household panel (SHP, 2000–2013, as described by FORS, 2013). We restrict our sample to respondents who were in paid and dependent employment, from 2005 to 2011: this provides us with a total of around 4'200 person-years for Switzerland.

[Insert Table 4 about here]

Our dependent variable is people's self-reported subjective well-being and is based on the question "How satisfied are you at present with your job as a whole?", with answers ranging from 0 (totally dissatisfied) to 10 (totally satisfied). The variable's distribution is shown in Figure 4.

[Insert Figure 4 about here]

To evaluate the degree of security, we used the probabilistic question asking individuals about the probability that they assign to losing their jobs. The exact question is "How likely or unlikely is that you will lose your job for some reason over the next twelve months?", with answers ranging from 0 (no risk at all) to 10 (a real risk). In light of the set of possible answers, we considered as "insecure" workers those stating that they were very likely or quite likely to lose their jobs (answer greater than 5) in the twelve months following the survey.

As discussed before, Switzerland provides a particularly appropriate market to examine the potential effects of flexicurity type arrangements.

To this end, following the measure of flexibility and security at the micro-level proposed by Origo and Pagani (2009), the sample of workers is classified into four groups (types) according to their employment contract

(permanent or temporary) and their perceived job security: "flexicure workers", who are on temporary contracts stating that they are not very likely to lose their jobs in the following twelve months, "insecure temporary workers", declaring they are very or quite likely to lose their jobs in the following year, "permanent-at-risk workers", who are permanent workers stating that they are very or quite likely to lose their jobs and "permanent workers", stating that they are not very likely to lose their jobs.

[Insert Figure 5 and 6 about here]

Figures 5 and 6 illustrate the distribution of the sample according to the scores for the degree of job satisfaction by type of worker showing a first perception into what matters for individual job satisfaction in terms of employment protection, as defined by the type of contract, or perceived safety regardless of the type of contract. In Figure 5 the workers are divided only according to their type of contract (permanent or temporary), while in Figure 6 workers are classified according to the categories mixing flexibility and security as discussed above. The first graph shows that it is not possible to indentify the impact of the type of contract alone on the perception of security in the workplace and its impact on the job security of workers. The second graph shows instead that, if we consider the four groups of workers defined by the combination of the type of contract and perceived job security, the distribution of satisfaction is similar, on the one hand, between flexicure secure temporary and permanent employment, on the other hand, between temporary workers and permanent at risk of insecurity.

[Insert Table 5 about here]

We therefore analyse whether workers who are heterogeneous in terms of both the type of labour contract and their perceived security do also differ with regard to life satisfaction and specific aspects of the job satisfaction.

5. Econometric strategy

Satisfaction variables, given the ordinal nature of the dependent variable, are usually analysed using Ordered Probit models.

In the realm of non-linear models with panel data, Wooldridge (2010) estimates the model parameters by a random effect ordered probit with the components modelled à la Mundlak, through a linear combination of regressors in group means. De Graaf Zijl (2012) uses instead a variant by Ferrer-i-Carbonell and Frijter (2004) of the fixed effect ordered logit minimum distance estimator by Das and Van Soest (1999). Hovewer, as discuseed by Bruno, Caroleo and Dessy (2013), all such estimators are computationally expensive, the first involving evaluation of multiple integrals and the last two requiring multiple estimation steps. Moreover, Baetschmann et al. (2011) proved that the various ways through which the Ferrer-i-Carbonell and Frijter (2004) method has been implemented leads to inconsistent estimators.

Van Praag and Ferrer-i-Carbonell (2006) developed also a procedure, called Probit OLS or POLS, that consists in transforming an ordinal dependent variable in a "pseudo" continuous one, and allows the application of a linear model. In their work, Van Praag and Ferrer-i-Carbonell show that this linear method yields consistent outcomes with the traditional Ordered Probit. The POLS method replaces the original dependent variable by its conditional mean, which obeys the same trade-off relations as its underlying component, except for a proportionality factor (indeed, Van Praag and Ferrer-i-Carbonell (2006) show that ordered probit and POLS estimates are almost identical upto a proportionality coefficient). Consequently, as in our analysis, the POLS procedure is perfect for the examination of ordinal variables, as job satisfaction. The transformation of the ordinal dependent variable consists of deriving those Z-values of a standard normal distribution that correspond to the cumulated frequencies of the different categories of the ordinal dependent variable.

With longitudinal data, finally, the POLS method permits for the inclusion of individual level fixed or random effects, obtaining consistent estimates wih fixed effects. As soon as it must be considered that (RE) POLS has stricter requirements on correlated individual effects than FE POLS (Van Praag and Ferrer-i-Carbonell, 2004), our methodology therefore estimates a linear fixed effects model, thus controlling for unobserved time-invariant characteristics. We also extend our analysis and seek to identify how insecurity affects temporary workers compared to permanent workers examining the impact of regional labour market conditions in the seven Swiss statistical regions[2].

The aim of the empirical analysis was therefore to study the determinants of perceived security, paying specific attention to the role of temporary contracts. In order to control for unobserved heterogeneity exploiting the longitudinal nature of the data, our preferred estimator is the FE POLS, whose estimates will be compared with those obtained with the common OLS linear model.

To this end, we estimated the following model that can be expressed in this general form as:

$$JS_{it} = \beta_1 \boldsymbol{F}_{it} + \beta_2 \boldsymbol{PR}_{it} + \beta_3 \boldsymbol{IT}_{it} + \gamma \boldsymbol{X}_{it} + \rho \boldsymbol{W}_{it} + \mu_i + \varepsilon_{it} \qquad (1)$$

In the baseline estimation, job satisfaction JS_{it} of worker i in year t is explained by the different contract types, where "Permanent and secure" employment acts as a reference category. $\boldsymbol{F}_{it}$, $\boldsymbol{PR}_{it}$ and $\boldsymbol{IT}_{it}$ are, in this way, dummy variables that assume the value one when the worker is "Flexicure", "Permament at Risk" and "Insecure temporary" and zero otherwise. The corresponding *Betas* measure the impact of different combinations of

[2] For statistical purposes, Switzerland is subdivided into seven regions at the NUTS-2 level: Eastern Switzerland: Cantons of St. Gallen, Thurgau, Appenzell Innerrhoden, Appenzell Ausserrhoden, Glarus, Schaffhausen, Graubünden; Zürich: Canton of Zürich; Central Switzerland: Cantons of Uri, Schwyz, Obwalden, Nidwalden, Lucerne, Zug; Northwestern Switzerland: Cantons of Basel-Stadt, Basel-Landschaft, Aargau; Espace Mittelland: Cantons of Bern, Solothurn, Fribourg, Neuchatel, Jura; Région lémanique: Cantons of Geneva, Vaud, Valais; Ticino: Canton of Ticino.

contract tipologies and perceived security. The individual-specific fixed effect μ_i is assumed to capture unobserved time-invariant factors as ability, optimism, motivation, or social background, as well as the baseline satisfaction level. The fixed-effects estimator permits the regressors to be correlated with the time-invariant components of the error μ_i, but assumes that they are uncorrelated with the idiosyncratic error ε_{it}, for which the usual properties are assumed. The baseline estimation displays the differences in job satisfaction of a worker in different contractual arrangements.

However, since in the baseline specification we do not control for (time variant) differences in personal, firm or job characteristics, the difference in job satisfaction may still be influenced also by these factors. As a consequence, we implement three different specifications starting with the most parsimonious one (Model 1), then we add a set of controls for observed personal and firm characteristics (gender, age, language, education, job sector, working intensity), described by the vector $\boldsymbol{X}_{it}$, (Model 2). In the last specification (Model 3), we include variables that might be proxies for different job-related characteristics, exploiting the richness of the data set and including also a large set of variables on workers' psychological attitudes toward work and life (vector $\boldsymbol{W}_{it}$).

We estimated the three models for the whole sample. The last (Model 3) was our preferred specification, and we used it to obtain the relevant estimates by gender, age and education.

6. Results

Results show that job stability and perceived security are not necessarily associated, and that job satisfaction is relatively low, mainly when perceived job security is low. The relationship between wellbeing and job security also varies according to employment and personal conditions.

In order to highlight the role of unobserved heterogeneity, Table 6 compare OLS and Fixed effects POLS estimates of the most parsimonious model (Model 1) for both on Job and Overall Satisfaction.

[Insert Table 6 about here]

Our results show that the job satisfaction of flexicure workers is greater than those of permanent workers (not statistically significative for overall satisfaction), and by contrast, compared to the latter, the job satisfaction of insecure temporary workers and those on permanent contracts at risk of unemployment is much lower.

Table 7 reports the relevant results from the estimation of Model 1, Model 2 and Model 3 by FE POLS. Estimates with the richest specification show that no statistically significant differences in job satisfaction emerge between permanent and flexicure workers (Model 3) and, by contrast, compared to the first, the job satisfaction of insecure temporary workers and those on permanent contracts at risk of unemployment is much lower. These results are rather robust to model specification, the only exception being that in Model 1 and Model 2 the difference in job satisfaction for flexicure workers is positive and statistically significative.

[Insert Table 7 about here]

Comparing our results with previous studies on the subject our job stability estimate is consistent with the evidence for Germay (Jahn, 2013) and (Beckmann, Binz, and Schauenberg, 2007), Italy (Bruno, Caroleo and Dessy, 2013) and Australia (Wooden et al., 2004; Green and Leeves, 2013). This is also in line with the findings of Origo and Pagani (2009) for the general European context, where job stability has been found strongly linked to workers' well-being.

To the contrary, De Graaf-Zijl (2008) finds that satisfaction with job content is one of the main job domains influencing job satisfaction in the

Netherlands and that this is independent of the worker's contract type. One possible explanation for the differences in the results might indeed be explained by the effective flexicurity policies implemented in the Netherlands and by the fact that we observe workers' psychological attitudes toward work and other important dimensions of job satisfaction that instead are not observed in the Dutch data.

6.1 Estimates by groups

In order to explore the existence of heterogeneous effects of the combination of flexibility and security on job satisfaction, Table 8 reports complete POLS estimates of Model 3 by gender, age and education.

[Insert Table 8 about here]

Our main results discussed above hold for males, while in the case of females we do not find statistically significant differences in job satisfaction for both groups of temporary workers, while permanent at risk workers are still statistically significant dissatisfied with their job compared with "permanent and secure" workers.

Dissatisfaction with working stress has been proven to be an important aspect of job satisfaction (Green et al. 2010); this also holds for Swiss workers and particularly for female workers that appear unhappier with reported stress than men.

Considering age heterogeneity, it can be noted that, if job satisfaction of the permanent contracts at risk of unemployment is significant for all the three age levels, young workers mainly drive the difference in job satisfaction for insecure temporary workers. Job stability is indeed the aspect with the highest negative, and significant, incidence on the job satisfaction of young workers, as proven by (Bruno, Caroleo and Dessy, 2013).

Estimates by education highlight that, after controlling for personal, firm and job characteristics, compared with "permanent and secure

workers" job satisfaction of "permanent at risk" workers is lower (and the difference is statistically significant) for workers with a higher education and the coefficient becomes much larger than that in Table 7 for the whole sample. This indicates that different job characteristics should compensate these workers for a presumably adverse contract type.

6.2 Other controls

Moreover, our estimates show that receiving help from the family partner increases the level of job satisfaction. This holds only for workers with an intermediate education while insecure temporary workers with a higher education are as satisfied with their jobs as their permanent counterparts. This could be due to the so called "FTC effect" (Beckmann et al., 2007) that expects that workers in multitasking jobs, even with a fixed-term contract, are more satisfied.

Turning first to men, results show that they are more satisfied if they receive help in the family life. The pattern for women is quite different, where this coefficient is not significant and interestingly seems that having children (in a couple) affect women's job satisfaction, while it seems to be a weak job characteristic for all men.

The effect of the political tendency is contradictory, being conflicting for young and older workers. If job satisfaction of young workers is negatively affected by a right tendency, the opposite holds for older workers.

Finally, as soon as regional effects are identified by movers across regions, but transition frequencies are extremely low in our data, coefficients on regional dummies are generally insignificant.

Nevertheless, insecure workers in "poor" regions (regions with a higher unemployment rate or worse economic characteristics) have a relatively lesser job satisfaction compared to workers in "wealthy" regions (those with lower unemployment rates). These results are consistent with the hypothesis as insecure workers in "poor performing" regions should be relatively more concerned about their employment opportunities.

7. Conclusions

In this study we have analysed the determinants of perceived job satisfaction, a summary measure reflecting how workers value various job characteristics, in Switzerland, paying specific attention to the role of temporary contracts. More specifically, we have empirically tested whether the negative effect of holding a temporary contract on a subjective measure of job satisfaction is influenced by workers characteristichs (such as gender, age and education). We split workers into four groups according to the flexibility/security mix characterising their employment relationship and we analysed the impact of this mix on overall job satisfaction. Using individual data from the Swiss Household Panel (SHP), we have shown that it is not the formal security as defined by the contract type or the working conditions alone that matter for job satisfaction but the subjectively perceived job security. Overall, also after controlling for endogeneity, our results show that the job satisfaction of insecure temporary workers and that of permanent-at-risk workers is much lower from that of permanent workers.

We estimated different specifications of a linear POLS model, starting from a parsimonious specification (controlling only for contract types and excluding personal characteristics) and progressively adding controls for job characteristics (as stress and working conditions), ending with a full specification including all the job-related variables that should produce effects on job satisfaction (as firm sector, occupation and tenure) or controls on psychological characteristics and attitudes towards work and life. Job stability and perceived security are valued in different ways and the lack of job security is a primary source of job dissatisfaction.

No significant differences emerge on the estimated effect by gender, while some heterogeneity is evident by age and education.

Our results indicate that the duration of the contract may be less important if the worker perceives that he is not at risk of unemployment. In this regard, from a point of view of policy, a greater “flexicurity” can be obtained either directly from employer, adopting changes in work

organization, or indirectly by policy makers through an appropriate mix of active labour market policies. The adoption of a proper mix of flexibility and security would also be crucial as its subsequent effects on perceived security. Labour turnover should in fact be higher, but more efficient, in the so-called "flexicure" countries, where perceived security is likely to be less influenced by the current recession.

Perceived security should be instead particularly carefully monitored in the countries where in the past, even during recovery years, labour turnover has been low and highly inefficient owing to the high levels of job insecurity prevailing also among permanent workers. With respect to the "pure flexibility" policy adopted to date by many economies Europe, the "flexicurity" approach may therefore be an alternative.

Figure 2 - Protection of permanent workers against individual and collective dismissals, 2013*.
***Data refer to 2013 for OECD countries and Latvia, 2012 for other countries. The figure presents the contribution of employment protection for regular workers against individual dismissal (EPR) and additional provisions for collective dismissal (EPRC) to the indicator of employment protection for regular workers against individual and collective dismissal (EPRC). The height of the bar represents the value of the EPRC indicator.**

Source: OECD Employment Protection Database, 2013 update.

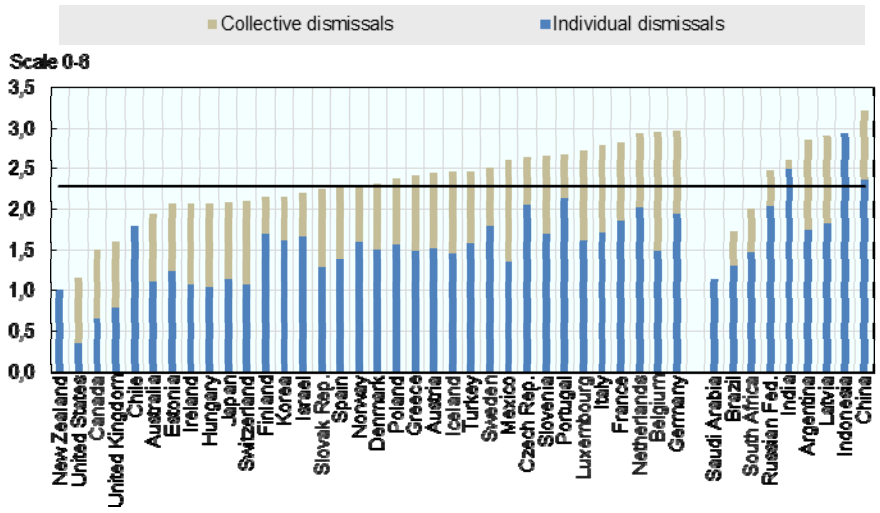

Figure 3 - Regulation on temporary contracts, 2013*.
*** Data refer to 2013 for OECD countries and Latvia, 2012 for other countries. The figure presents the contribution of the indicator of regulation for standard fixed-term contracts (EPFTC) and the indicator of regulation for TWA employment (EPTWA) to the indicator of regulation on temporary contracts (EPT). The height of the bar represents the value of the EPT indicator.**

Source: OECD Employment Protection Database, 2013 update.

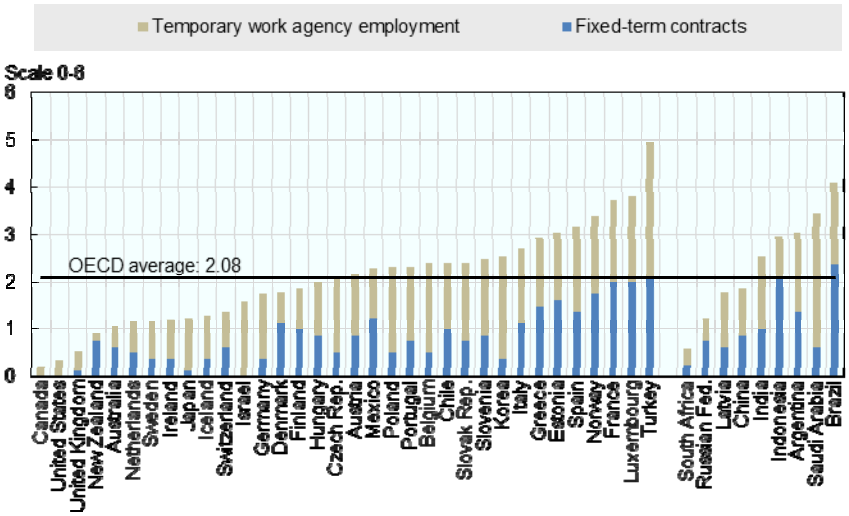

Figure 4 - Distribution of job satisfaction in Switzerland, by year.

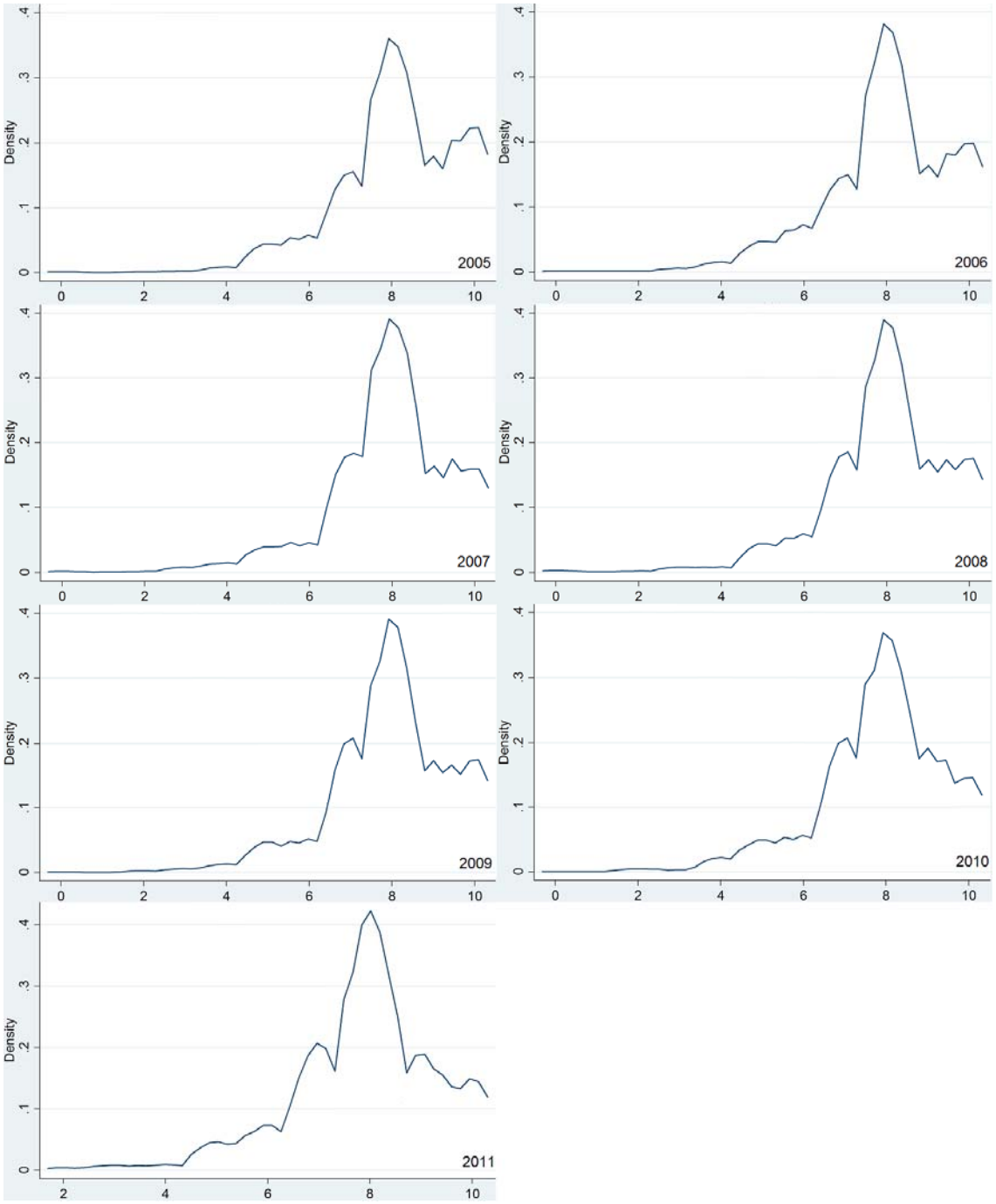

Figure 5 - Job satisfaction by types of workers ("Permanent", "Temporary").

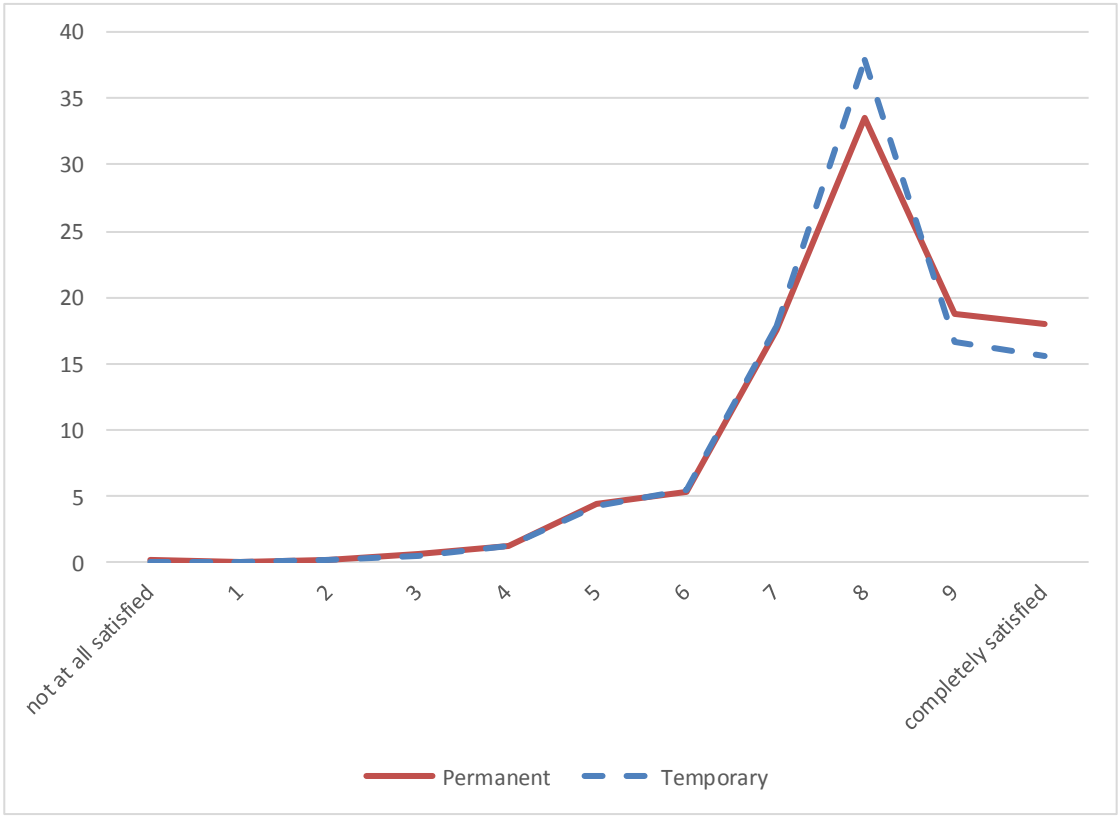

Figure 6 - Job satisfaction by types of workers ("Permanent at Risk", "Insecure temporary", "Flexicure", "Permanent and secure").

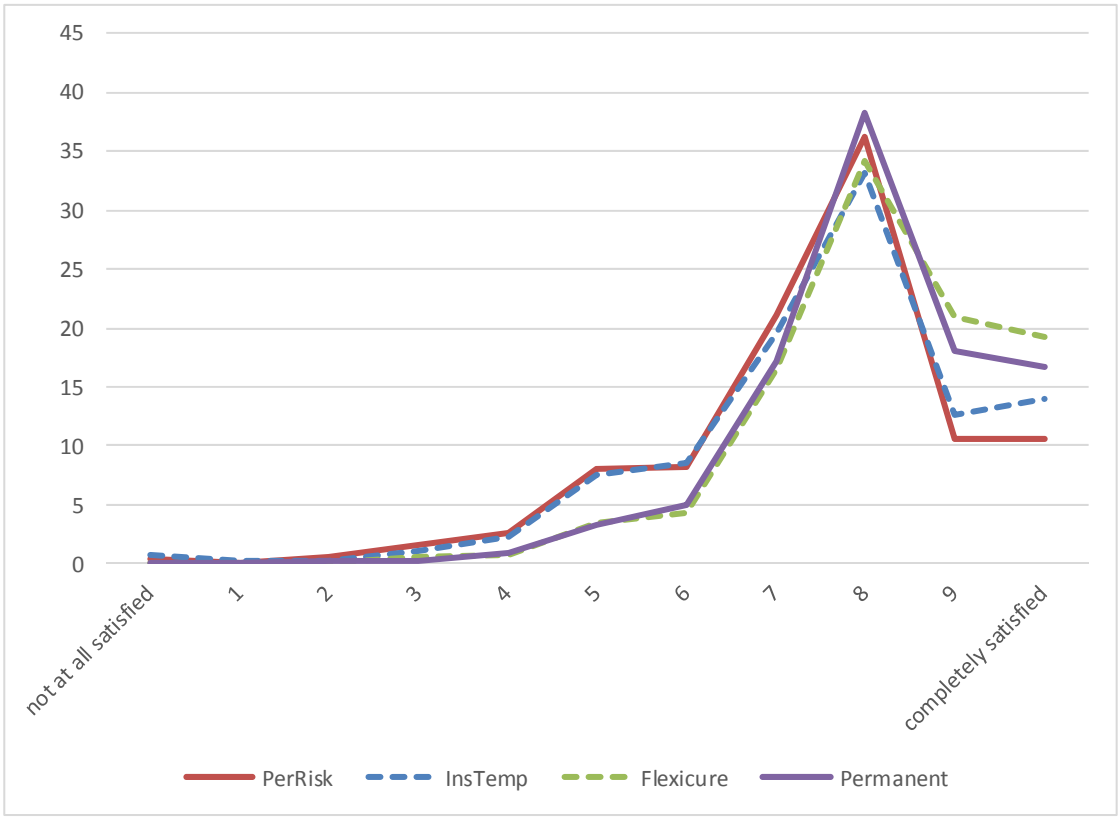

Table 4 - Descriptive statistics

Variable	Description	Mean	Std. Dev.
Types			
permanent	1 if permanent worker not very/not at all likely to lose job in the following year	0.7055521	0.4558025
instemp	1 if seasonal, temporary or casual job and employees under contract or for fixed time period, very/quite likely to lose job in the following year	0.036806	0.1882886
flexicure	1 if seasonal, temporary or casual job and employees under contract or for fixed time period, not very/not at all likely to lose job in the following year	0.1015376	0.3020447
perrisk	1 if permanent worker very/quite likely to lose job in the following year	0.1561044	0.3629609
Individual and local characteristics			
age	Age (continuous)	39.98767	22.07502
age2	Squared age (continuous)	2086.314	1847.392
female	1 if female	0.5149582	0.4997794
married	1 if married	0.4630372	0.4986351
children	1 if not-married couple with children	0.0126515	0.111766
marchildren	1 if married couple with children	0.504654	0.4999816
famhelp	1 if receives help form partner	0.7742639	0.418073
young	1 if age<31	0.3603915	0.4801171
middleaged	1 if age>31 & age<50	0.2921895	0.4547719
older	1 if age>50	0.3474191	0.4761533
lang1	1 if language French	0.2576662	0.437352
lang2	1 if language German	0.6978513	0.4591923
lang3	1 if language Italian	0.0444825	0.2061659
eduinf	1 if primary educaton	0.2961684	0.4565694
edumid	1 if apprenticeship, full-time vocational school	0.5195185	0.4996223
edusup	1 if high school, university	0.1843131	0.387742
small_town	1 if lives in small or middle sized town	0.0798875	0.2711206
large_town	1 if lives in large town	0.1914589	0.3934519
Employment characteristics			
lowinc	1 if low income	0.3683553	0.4823662
midinc	1 if medium income	0.1984487	0.3988379
highinc	1 if high income	0.3666592	0.4819001
professional	1 if professionals	0.1661706	0.3722393
hightech	1 if higher supervisory/technicians	0.2380938	0.4259233
desk	1 if intermediate occupations	0.1969384	0.3976914
self	1 if self employed	0.0693415	0.2540378

Variable	Description	Mean	Std. Dev.
lowtech	1 if lower supervisors and technicians	0.0223545	0.1478359
routine	1 if routine job	0.0916353	0.2885148
lowhour	1 if low than 25 work hours/week	0.2434423	0.4291671
midhour	1 if between 25 work hours/week and 42 work hours/week	0.3748516	0.4840923
highhour	1 if more than 42 work hours/week	0.2924402	0.4548912
nightwork	1 if night work	0.1246501	0.3303267
satwork	1 if work on Saturday	0.4809949	0.4996461
stresswork	1 if stressful job	0.3388675	0.4733318
lowint	1 if low intensity job	0.2406824	0.4275042
midint	1 if medium intensity job	0.5364157	0.4986796
highint	1 if high intensity job	0.2229019	0.4161993
Region of residence			
r1	1 if Lake Geneva (VD, VS, GE)	0.1772811	0.3819089
r2	1 if Middleland (BE, FR, SO, NE, JU)	0.2458528	0.4305945
r3	1 if North-west Switzerland (BS, BL, AG)	0.1404818	0.3474885
r4	1 if Zurich	0.1719964	0.3773798
r5	1 if East Switzerland (GL, SH, AR, AI, SG, GR, TG)	0.1287267	0.3348993
r6	1 if Central Switzerland (LU, UR, SZ, OW, NW, ZG)	0.0982947	0.2977147
r7	1 if Ticino	0.0373664	0.1896593
Political party			
left	1 if left	0.2412348	0.4278374
centre	1 if centre	0.559878	0.4964075
right	1 if right	0.1010383	0.301383
Job characteristics			
noga1	1 if Agriculture, hunting, forestry	0.0294874	0.1691711
noga2	1 if Fishing and fish farming	0.0002743	0.0165601
noga3	1 if Mining and quarrying	0.0005829	0.0241365
noga4	1 if Manufacturing	0.1459626	0.3530748
noga5	1 if Electricity, gas and water supply	0.0068232	0.0823221
noga6	1 if Construction	0.0475227	0.2127577
noga7	1 if Wholesale,retail; repair motor vehicles,household goods	0.1221327	0.3274446
noga8	1 if Hotels and restaurants	0.0271558	0.1625402
noga9	1 if Transport, storage and communication	0.0514315	0.22088
noga10	1 if Financial intermediation; insurance	0.0603463	0.2381314
noga11	1 if Real estate; renting; computer; research	0.1244985	0.3301551

Variable	Description	Mean	Std. Dev.
noga12	1 if Public admin,national defence; compulsory social security	0.065558	0.2475122
noga15	1 if Other community, social and personal service activities	0.0662781	0.2487718
noga16	1 if Private households with employed persons	0.0009943	0.0315181

Table 5 - Workers' types

types	Freq.	Percent	Cum.
InsTemp	1.003	3,68	3,68
PerRisk	4.254	15.61	19.29
Flexicure	2.767	10,15	29.44
Permanent	19.227	70.56	100.00
Total	27.251	100.00	

Table 6 - Job (z) and Overall (y) Satisfaction - OLS and Fixed effects POLS (Model 1)

VARIABLES Ref. group permanent workers	OLS y	OLS z	FE POLS y	FE POLS Z
instemp	-0.273***	-0.287***	-0.075***	-0.113***
	[0.029]	[0.031]	[0.028]	[0.032]
flexicure	0.118***	0.074***	0.028	0.136***
	[0.018]	[0.019]	[0.022]	[0.025]
perrisk	-0.313***	-0.391***	-0.081***	-0.183***
	[0.015]	[0.016]	[0.014]	[0.016]
Observations	26,466	26,450	26,466	26,450
R-squared	0.022	0.026	0.002	0.009
Number of idpers			7,368	7,366

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 7 - Job Satisfaction - Fixed effects POLS (Model 1, Model 2 and Model 3)

	(1)	(2)	(3)
VARIABLES	z	z	z
Ref. group permanent workers			
instemp	-0.113***	-0.144***	-0.169***
	[0.032]	[0.053]	[0.059]
flexicure	0.136***	0.081*	0.007
	[0.025]	[0.045]	[0.049]
perrisk	-0.183***	-0.211***	-0.230***
	[0.016]	[0.023]	[0.026]
Other controls			
Individual and local characteristics	NO	YES	YES
Employment characteristics	NO	YES	YES
Region of residence	NO	NO	YES
Political party	NO	NO	YES
Job characteristics	NO	NO	YES
Observations	26,450	13,269	11,093
R-squared	0.009	0.026	0.034
Number of idpers	7,366	4,840	4,271

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 8 - Job Satisfaction overall and by gender, age, education - Fixed effects POLS (Model 3)

VARIABLES Ref. group permanent workers	(3) z Overall	(3) z females	(3) z male	(3) z young	(3) z mid'aged	(3) z older	(3) z eduinf	(3) z edumid	(3) z edusup
instemp	-0.169***	-0.118	-0.238***	-0.337***	-0.033	-0.170	-0.189	-0.277***	0.076
	[0.059]	[0.080]	[0.090]	[0.114]	[0.095]	[0.132]	[0.210]	[0.078]	[0.119]
flexicure	0.007	-0.045	0.077	0.003	0.007	-0.090	-0.167	-0.048	0.086
	[0.049]	[0.065]	[0.076]	[0.099]	[0.077]	[0.101]	[0.198]	[0.069]	[0.088]
perrisk	-0.230***	-0.250***	-0.216***	-0.431***	-0.229***	-0.168***	-0.184	-0.219***	-0.248***
	[0.026]	[0.038]	[0.035]	[0.084]	[0.034]	[0.048]	[0.119]	[0.031]	[0.053]
age	-0.071***	-0.066**	-0.073**	-0.126	-0.076	-0.166	-0.080	-0.060**	-0.128***
	[0.022]	[0.032]	[0.032]	[0.152]	[0.056]	[0.147]	[0.088]	[0.029]	[0.049]
age2	0.001***	0.001*	0.001**	0.002	0.001	0.002	0.001	0.001**	0.001**
	[0.000]	[0.000]	[0.000]	[0.003]	[0.001]	[0.001]	[0.001]	[0.000]	[0.001]
married	-0.016	-0.004	-0.030	0.089	-0.082	0.277	-0.703	0.015	-0.067
	[0.057]	[0.085]	[0.077]	[0.131]	[0.082]	[0.223]	[0.436]	[0.079]	[0.091]
children	0.100	0.158	0.063	1.205**	0.015	-	-0.245	0.191	-0.095
	[0.140]	[0.244]	[0.168]	[0.569]	[0.153]	-	[0.868]	[0.193]	[0.232]
marchildren	-0.092**	-0.109**	-0.075	-0.097	-0.036	-0.056	0.100	-0.074	-0.089
	[0.039]	[0.056]	[0.054]	[0.095]	[0.070]	[0.065]	[0.223]	[0.051]	[0.071]
famhelp	0.074***	0.024	0.129***	0.069	0.038	0.159***	0.088	0.090***	0.027
	[0.025]	[0.038]	[0.034]	[0.082]	[0.034]	[0.043]	[0.108]	[0.031]	[0.049]
young	-0.091	-0.091	-0.103	-	-	-	0.103	0.092	-0.377***
	[0.066]	[0.094]	[0.094]	-	-	-	[0.539]	[0.092]	[0.105]
older	0.002	0.068	-0.066	-	-	-	-0.285	0.031	0.028
	[0.048]	[0.069]	[0.067]	-	-	-	[0.227]	[0.059]	[0.096]
lang1	0.092	0.193	0.000	-0.083	0.031	-0.085	-	-0.118	0.323
	[0.182]	[0.287]	[0.233]	[0.928]	[0.253]	[0.330]	-	[0.248]	[0.293]
lang3	0.134	0.193	0.025	0.371	-0.074	1.579*	-0.735	-0.158	0.461
	[0.262]	[0.443]	[0.324]	[0.895]	[0.313]	[0.850]	[0.990]	[0.319]	[0.932]
eduinf	-0.044	0.065	-0.163	-0.057	0.065	-0.089	-	-	-
	[0.078]	[0.103]	[0.125]	[0.131]	[0.169]	[0.181]	-	-	-
edusup	0.109*	0.141	0.082	-0.154	0.328***	0.004	-	-	-
	[0.065]	[0.089]	[0.100]	[0.138]	[0.098]	[0.171]	-	-	-
small_town	-0.062	-0.030	-0.071	-0.038	-0.133	0.190	0.683*	-0.144	-0.110
	[0.101]	[0.134]	[0.160]	[0.221]	[0.144]	[0.277]	[0.402]	[0.143]	[0.171]
large_town	-0.085	0.005	-0.185*	-0.123	-0.078	0.049	0.146	-0.069	-0.193*
	[0.068]	[0.097]	[0.099]	[0.140]	[0.099]	[0.181]	[0.482]	[0.095]	[0.117]
lowinc	0.107***	0.120***	0.070	0.066	0.155***	0.086	0.349**	0.134***	0.024
	[0.037]	[0.045]	[0.070]	[0.091]	[0.051]	[0.079]	[0.173]	[0.047]	[0.073]
highinc	-0.013	0.002	-0.020	0.177**	-0.022	-0.122*	0.002	-0.007	-0.017
	[0.032]	[0.049]	[0.044]	[0.088]	[0.044]	[0.064]	[0.187]	[0.041]	[0.060]
professional	0.194***	0.250**	0.105	0.229	0.080	-0.028	0.928**	0.025	0.491***
	[0.072]	[0.114]	[0.095]	[0.165]	[0.105]	[0.179]	[0.420]	[0.096]	[0.178]
hightech	0.193***	0.226**	0.123	0.321**	0.144	-0.064	0.549*	0.066	0.451***
	[0.063]	[0.097]	[0.085]	[0.154]	[0.089]	[0.155]	[0.313]	[0.078]	[0.171]

VARIABLES Ref. group permanent workers	(3) z Overall	(3) z females	(3) z male	(3) z young	(3) z middleaged	(3) z older	(3) z eduinf	(3) z edumid	(3) z edusup
desk	0.176**	0.168*	0.154	0.263*	0.134	-0.011	0.925**	0.114	0.285
	[0.069]	[0.098]	[0.102]	[0.150]	[0.098]	[0.176]	[0.393]	[0.083]	[0.181]
lowtech	-0.004	-0.006	-0.012	0.086	-0.048	0.217	0.179	-0.057	0.065
	[0.092]	[0.159]	[0.110]	[0.339]	[0.106]	[0.242]	[0.330]	[0.109]	[0.241]
lowhour	-0.059*	-0.082*	0.037	-0.199*	-0.092*	0.045	-0.065	-0.057	-0.002
	[0.035]	[0.042]	[0.070]	[0.106]	[0.048]	[0.067]	[0.160]	[0.046]	[0.062]
highhour	0.014	0.021	0.013	0.034	0.019	-0.008	0.225*	0.004	0.046
	[0.026]	[0.049]	[0.030]	[0.069]	[0.036]	[0.049]	[0.123]	[0.033]	[0.048]
nightwork	-0.032	0.002	-0.050	0.072	-0.060	-0.051	0.145	-0.024	-0.093
	[0.038]	[0.068]	[0.046]	[0.110]	[0.050]	[0.078]	[0.163]	[0.049]	[0.075]
satwork	-0.015	0.010	-0.033	-0.021	-0.018	0.038	0.047	-0.018	0.024
	[0.024]	[0.037]	[0.032]	[0.073]	[0.031]	[0.048]	[0.112]	[0.032]	[0.042]
		-	-	-			-	-	
stresswork	-0.134***	0.162***	0.112***	0.190***	-0.134***	-0.089**	0.282**	0.138***	-0.095**
	[0.023]	[0.034]	[0.030]	[0.064]	[0.030]	[0.043]	[0.113]	[0.029]	[0.040]
lowint	0.040	0.060	0.023	0.052	0.085**	-0.048	0.296**	0.025	0.042
	[0.026]	[0.038]	[0.036]	[0.083]	[0.036]	[0.045]	[0.117]	[0.032]	[0.051]
highint	-0.038	-0.040	-0.033	-0.180**	-0.003	-0.036	-0.182	-0.041	-0.010
	[0.025]	[0.036]	[0.033]	[0.076]	[0.032]	[0.048]	[0.122]	[0.031]	[0.046]
r1	-0.069	0.453	-0.602	1.180*	-1.443**	-	-	0.386	-0.218
	[0.349]	[0.479]	[0.533]	[0.613]	[0.661]	-	-	[0.727]	[0.437]
r2	-0.136	0.187	-0.651	0.437	-0.800**	-0.349	-	-0.231	-0.217
	[0.231]	[0.292]	[0.441]	[0.455]	[0.381]	[0.896]	-	[0.467]	[0.295]
r3	0.171	0.407*	-0.133	0.405	-0.205	0.035	-	0.009	0.080
	[0.173]	[0.245]	[0.261]	[0.337]	[0.290]	[0.583]	-	[0.297]	[0.249]
r5	0.579***	0.851***	0.337	0.845**	-0.289	0.985*	-	0.332	0.201
	[0.203]	[0.284]	[0.299]	[0.331]	[0.344]	[0.538]	-	[0.364]	[0.297]
r6	0.240	0.428	0.064	0.626	-0.164	-	-	0.268	0.028
	[0.232]	[0.359]	[0.305]	[0.643]	[0.280]	-	-	[0.416]	[0.305]
r7	0.832	0.377	1.078	-	0.412	-	-	0.647	-
	[0.536]	[0.811]	[0.713]	-	[0.579]	-	-	[0.585]	-
left	-0.023	0.011	-0.065	0.193**	-0.085**	-0.005	-0.005	-0.007	-0.040
	[0.031]	[0.042]	[0.044]	[0.091]	[0.041]	[0.057]	[0.131]	[0.039]	[0.056]
right	0.046	0.049	0.057	-0.281**	0.028	0.235***	0.304**	0.003	0.171
	[0.044]	[0.074]	[0.053]	[0.120]	[0.063]	[0.076]	[0.154]	[0.052]	[0.109]
noga1	0.060	0.266	-0.188	-0.497	0.358	-0.042	-1.676	0.121	0.443
	[0.166]	[0.250]	[0.223]	[0.394]	[0.219]	[0.366]	[1.017]	[0.184]	[0.455]
noga2	0.899	-	0.792	-	-	-	-	0.897	
	[0.909]	-	[0.868]	-	-	-	-	[0.908]	
noga3	1.275*	-	1.175*	-	1.227*	-	1.734**	-	-
	[0.720]	-	[0.687]	-	[0.720]	-	[0.837]	-	-
noga5	0.144	0.138	0.140	-	0.328	0.394	-	0.224	-0.024
	[0.237]	[0.585]	[0.251]	-	[0.336]	[0.383]	-	[0.386]	[0.314]
noga6	0.251**	0.726***	0.141	0.252	0.202	0.961***	0.703*	0.174	0.047
	[0.113]	[0.251]	[0.125]	[0.234]	[0.163]	[0.285]	[0.388]	[0.141]	[0.311]
noga7	-0.091	-0.094	-0.087	0.021	-0.098	-0.220	-0.118	-0.007	0.050
	[0.063]	[0.090]	[0.092]	[0.155]	[0.086]	[0.166]	[0.250]	[0.078]	[0.165]
noga8	-0.045	-0.092	0.050	-0.158	0.093	0.243	-0.172	0.103	0.643**
	[0.114]	[0.160]	[0.167]	[0.260]	[0.157]	[0.289]	[0.365]	[0.152]	[0.293]

VARIABLES Ref. group permanent workers	(3) z Overall	(3) z females	(3) z male	(3) z young	(3) z mid'aged	(3) z older	(3) z eduinf	(3) z edumid	(3) z edusup
noga9	-0.212**	-0.262*	-0.200*	-0.457*	-0.087	0.022	-0.223	-0.093	-0.528***
	[0.088]	[0.148]	[0.111]	[0.242]	[0.112]	[0.226]	[0.523]	[0.107]	[0.195]
noga10	-0.115	-0.384**	0.073	-0.159	-0.057	0.293	-0.007	0.004	0.076
	[0.105]	[0.162]	[0.138]	[0.242]	[0.140]	[0.346]	[1.157]	[0.137]	[0.193]
noga11	-0.114*	-0.185*	-0.055	-0.212	-0.201**	0.355**	-0.045	-0.011	-0.244**
	[0.063]	[0.098]	[0.084]	[0.174]	[0.084]	[0.138]	[0.305]	[0.089]	[0.101]
noga12	0.054	0.107	-0.001	0.059	0.086	0.382**	0.787	0.105	0.048
	[0.075]	[0.110]	[0.103]	[0.284]	[0.094]	[0.185]	[0.478]	[0.109]	[0.112]
noga15	-0.101	-0.072	-0.147	-0.029	-0.184*	-0.019	-0.089	-0.089	-0.164
	[0.072]	[0.103]	[0.104]	[0.202]	[0.105]	[0.134]	[0.301]	[0.107]	[0.112]
noga16	0.509	-	0.569	0.701	-	0.257	-	1.178*	0.126
	[0.431]		[0.413]	[0.568]	-	[0.877]	-	[0.641]	[0.580]
Observations	11,093	5,690	5,403	2,081	6,143	2,869	932	7,118	3,043
R-squared	0.034	0.041	0.040	0.118	0.040	0.056	0.180	0.032	0.052
Number of idpers	4,271	2,213	2,058	1,146	2,326	1,152	556	2,794	1,145

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

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Chapter 3

An agent-based simulation of the Swiss labour market: an alternative for policy evaluation

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Abstract

Active labour market policies (ALMPs), which are primarily addressed to integrate (or reintegrate) into the labour market those who are on the edge of unemployment, are generally analysed in the context of a macroeconomic approach or within a micro-econometric model. A critique of the usual economic analysis of labour markets states, however, that a standard economic approach does not take into account the importance of the social environment in the demand-supply matching process.

In order to address this problem Agent-based Computational Economics (ACE) can present both a generic model in order to explain a complex phenomenon at a very abstract level and can be based on empirical data to describe a particular case study. The purpose of this paper, applying ACE models approach, is therefore to link micro-level and macro-level evaluations with an integrated (micro/macro) simulation model, trying to further diversify the battery of instruments used for ALMPs evaluation.

The implemented ACE model defines a virtual regional labour market with firms and worker agents. Firms are assigned different sectors and have sector-specific skill requirements. The policy maker agent defines active labour market policies, thus financing the unemployed workers' human capital investment. During the simulation periods each firm opens vacant positions and receives applications; it then randomly chooses one applicant which fits with the firm's skill requirements. Firms are also hit by shocks and dismiss their employees that are "too costly" (the worker's "cost" depending on two factors, his productivity and his nationality). Unemployed workers have to invest in their human capital to qualify for vacancies opened in different sectors. The model has been structured in modules (taking in consideration subsidized training and job displacement effects), which allow the user to enable or disable some features while exploring different policy options. Following

the exposed perspective, we have developed a case study to test and validate the application of the proposed model and framework, exploring the regional labour market in southern Switzerland (Ticino and some districts of the Grisons), where the particular geographical position of the Italian-speaking part of Switzerland was an incentive to build strong relationships between the cantons and the neighbouring Italian provinces. The model describes an environment where individual agents, their micro-level decisions and the macro level policies interact in a systemic way.

Specifically, this study seeks to identify traceable connections between micro and macroeconomic scales exploring the regional labour market. At this point, the model is still experimental and calibration is very preliminary but it already allows to approximate quite a number of stylized features of this regional labour market. The model is programmed into NetLogo, a program specifically designed to accommodate agent-based modelling.

JEL codes: C63; J61; J68

Keywords: Labor market policy evaluation; Agent-based computational model

1. Introduction

Labour policies include measures that, in addition to acting directly on the labour market, may also refer to individuals. They aim at facilitating the matching of supply and demand and at improving the access to employment for the disadvantaged.

In this sense, a first definition (Salesi, Piras and Poggiu (eds.), 2004) can describe labour market policies as public interventions in the labour market addressed to reach its efficient functioning and to correct imbalances. A simple classification can divide labour policies into two broad categories:

a) passive policies, implemented to alleviate the discomfort created by unemployment (unemployment benefits, early retirement, etc.);

b) active policies, defined to directly affect the employment opportunities of individuals.

In this case they can deal with interventions for the employees (public employment services, guidance, support for job search) or firms (public sector job creation, incentives to hiring, training subsidies).

However, active policies are primarily aimed at integrating (or reintegrating) into the labour market those who are on the edge of unemployment. The long-term objective, consistent with the previous definition of active policy, is to pursue the most efficient functioning of the labour market, reducing the long-term unemployment.

For many years, this issue and the process through which firms and workers meet in the labour market has been extensively studied and the matching process that affects employment and unemployed dynamics has been a central research topic in labour economics. Most of the literature has tried to explain these phenomena on the grounds of a standard "toolbox" based on micro-foundations, which postulate hyper-rational firms and workers: the "representative individual hypothesis" is often employed to overcome difficulties entailed by aggregation of heterogeneous agents. Moreover, static equilibrium conditions are largely used to interpret macroeconomic dynamics (Fagiolo, Dosi, and Gabriele, 2004).

Following this approach Active Labour Market Policies (ALMPs) are generally analysed in the context of a macroeconomic approach or within a micro-econometric model. The latter is used among many authors (Kluve, 2010). This study, using a meta-analysis, based on a data set that includes 137 programs from 19 countries, shows that it is almost exclusively the program type that seems to influence the effectiveness of the program.

A critique of the usual economic analysis of labour markets states, however, that a standard economic approach does not take into account the importance of "social networks" in the labour process. Recent research, indeed, based on empirical findings (Pellizzari, 2011; Rebien, 2010; Dawid and Gemkov, 2013), highlights that social contacts like friends or relatives, organized in different types of networks (according to the average number of fiends/relatives and the density of the network) have a substantial impact on the matching process. This view holds that relationships are fundamental to both employers and workers, since they are more likely to apply for jobs where they have a personal connection, and are more likely to be hired if they have "soft" skills.

Moreover, workers (and jobs) are different and require different abilities. As highlighted in the analysis of search policy started by McCall (1970), only in the simplest job search model the searcher is assumed to know both the distribution of wages for his particular skills and the cost of generating a job offer and job offers are consequently independent random selections from the distribution of wages. These offers occur periodically and are either accepted or rejected. Under these conditions the optimal policy for the job searcher is to reject all offers below a single critical number and to accept any offer above this critical number. However, a searcher in the labour market is clearly concerned not only with the hourly, weekly, or annual wage rate, but also with the anticipated period of employment. If other things are equal, the longer the period of employment, the more favourable the job opportunity is. The job searcher frequently possesses inadequate knowledge about the distribution of wages appropriate to his skills. In this circumstance, it is important that he revises his estimate of the wage distribution as offers are made. If his

initial estimate is high, an adaptive policy reduces the period of frictional unemployment, and, conversely if his initial estimate is low. In order to solve this issue an adaptive search policy has to be applied: in addition to saving computational time, automated contracting through computational agents can increase search efficiency in certain problem applications.

The purpose of this paper is therefore to further diversify the battery of instruments used for these assessments, focusing on an analysis at the regional level. We propose a different interpretative strategy based on the acknowledgement that both firms and workers live in a complex system which evolves through time and might be characterized by endogenous, persistent, different agents, that are heterogeneous in their endowments, wealth, behaviour and rationality (Fagiolo, Dosi, and Gabriele, 2004).

Starting from this context, agent-based computational economics (ACE) models (Testfasion, 1998) identify a generic model in order to explain a complex phenomenon at a very abstract level. At the same time, this kind of model can be based on empirical data to describe a particular case study. Finally, ACE models include spatial characteristics. A person located in an area with low labour demand will have a lower probability of get an employment. This fact is seldom covered in standard economic approaches (Dibble, 2006).

This paper follows therefore an agent-based models (ABMs) approach trying to link micro-level and macro-level evaluations and focusing on the interactions between economic agents. The so constructed model will actually try to describe the dynamic matching between labour supply and demand and how it is affected by specific changes in policy and social parameters.

The paper is organized as follows. In Section 2 we start by describing the convenience of evaluating Labour Market Policies with ACE. In Section 3, we present the model and we discuss its characteristics, design concepts and functional specifications, according to Dahlem ABM documentation (Wolf et. al., 2010). We next present, in section 4, two test-experiments and first results. Finally, Section 5 draws some conclusions and perspectives.

2. Policy evaluation with ACE

Recently, agent-based models have been proposed in order to support labour policy makers in their decisions: a similar argument holds for many policy questions, which are typically related to at least some aspects of economy, technology, and actor behaviour (Chappin, Chmieliauskas and de Vries, 2012). With agents in a computer, it becomes possible to recreate actual world on an artificial basis, to see the effects of the action and interaction. As Wiener, the actual founder of cybernetics, said[1]:

"A material model is the representation of a complex system by a system which is assumed simpler and which is also assumed to have some properties similar to those selected for study in the original complex system. A formal model is a symbolic assertion in logical terms of an idealized relatively simple situation sharing the structural properties of the original factual system. Material models are useful in the following cases. a) They may assist the scientist in replacing a phenomenon in an unfamiliar field by one in a field in which he is more at home. (. . .) b) A material model may enable the carrying out of experiments under more favourable conditions than would be available in the original system".

Substituting to the "material model" idea (the actual artefact) an agent-based model (the synthetic artefact), we can have the capacity of making "experiments under more favourable conditions than would be available in the original system".

In social science, indeed, models are generally built in two ways, as a verbal argumentation or as mathematical equations, typically with statistics and econometrics. The first way is absolutely flexible and adaptable, but mere descriptions and discussion, by their nature, preclude tests and verifications of hypotheses. In contrast, the second way allows for computations and veri-

[1] Rosenblueth, A., Wiener, N.: The Role of Models in Science, in "Philosophy of Science", vol. 12, 1945, n. 4, pp. 316-321 (1945), cited in (Terna, 2013).

fications, but suffers from severe limitations in flexibility and adaptation, especially with respect to how agents are expected to operate in the model and when accounting for their heterogeneity and interactions (Terna, 2013).

Computer simulation can be considered as a "third way" that can combine an extreme flexibility of a computer code where it is possible to create agents who act, make choices, and react to the choices of other agents and to modification of their environment and its computational power. This approach allows researchers to use the descriptive capabilities of verbal argumentation and the ability to calculate the effects of different situations and hypotheses together.

However, the application of agent-based models (ABMs) for policy evaluation is still limited: usually policy makers are presented with model outcomes, which depend strongly on the choice of scenarios and many other assumptions, and typically do not have access to the models themselves, as it takes technical expertise to run and interpret them. ABMs may actually be unwanted to policy makers, as they might confront them with the fact that for many of their objectives, they have limited control options. On the other hand, if ABMs are built with sufficient richness and organisation to be applicable to real policy questions, simulation can act as a sort of magnifier that may be used to understand reality in a better way.

Moreover, these new approaches are challenging, because new modelling techniques such as ABMs are not established in the way that traditional ones are (Lejour et al., 2006). It is not possible, indeed, to assess the macroeconomic consequences of labour market policies using a pure micro-approach; in the same way a macro-approach does not permit to look at an individual level, making impossible to evaluate the impact of ALMPs on a precise target group. Agent-based labour market models allow the extraction of information based on aggregate outcomes, that are fully explained by the characteristics of the agents and the systemic structure of their actions.

Since these type of models simulate a complete set of individual observations they are also useful in addition to the micro-econometric evaluation approach ex post. A final advantage is that the simulation at the individual

level can help to formulate hypotheses on the micro-economic agent's behaviour using simple and intuitive rules, closer to the reality than the abstraction of rational aggregate models. This greater attention to micro-economic behaviour characterizes the current ACE research.

3. The model

Following Dahlem ABM documentation guidelines (Wolf et al., 2010), the features of the model are structured as follows.

a. Overview

The proposed approach has been implemented with an integrated (micro/macro) simulation model. The model has been structured in modules (until now, two modules were implemented: subsidized training and job displacement effects), which let the user enable or disable some features to explore different policy options. Following the exposed perspective, we have developed a case study to test and validate the application of the proposed methodology and framework.

The implemented ACE model considers a virtual regional labour market with firms and worker agents. Firms are assigned different sectors and have sector-specific skill requirements.

Let's consider a virtual word populated by a number *nWork* of worker agents. Each worker has assigned a nationality (Swiss or foreigner), an initial random skill S_i and an initial productivity P_i.

There are *nSect* sectors in the virtual word and *nFirm* number of firms. The number *nSect* has to be <= *nFirm*. As in (Neugart 2009) each firm has different skill requirements. Each firm is also assigned a random number of available vacancies. The policy maker agent defines active labour market policies.

During the simulation periods firms are hit by shocks and dismiss their employees that are "too costly". The worker's "cost" depends on his productivity and his nationality (wage inequality, as described in Browne and Misra,

2003). Unemployed workers have to invest in their human capital to qualify for vacancies opened in different sectors. The policy maker finances the unemployed workers' human capital investment.

At present the model doesn't consider an explicit relationship structure between agents, but, depending on their "upgrading decision" on vacancies, that in turn depends on firm's and agent's decision, an implicit relationship holds.

The model deals with the complex issue of aggregated phenomena in the regional labour market, characterized by an environment where individual agents (firms and worker agents), their decisions at the micro-level and the policies defined at a macro level interact in a systemic way.

We are therefore addressing some subjects like connecting the economic and cellular spatial simulation models, and connecting the conventional econometric model to the developed integrated model. Specifically, this study seeks to identify traceable connections between micro and macroeconomic scales exploring the regional labour market in southern Switzerland (Ticino and some districts of the Grisons), where the particular geographical position of the Italian-speaking part of Switzerland was an incentive to build strong relationships between the cantons and the neighbouring Italian provinces. As an example one in four workers is a trans-border commuter.

The benefits of this type of model are potentially many. The most obvious advantage is that it permits to simulate at an individual level the political impact of highly differentiated policies. This advantage has its counterpart in terms of results. Such a model that simulates a sample of individuals or firms can give messages on the evolution of a very large number of output variables, that were explicitly intended or not by the modeller: employment rates, unemployment, labour turnover, length of stay in different states.

The model is programmed into NetLogo[2], a program specifically designed to accommodate agent-based modelling, which has a programming language which is flexible and easy to learn.

[Insert Figure 7 about here]

b. Design Concepts

When a simulation starts firms and workers are randomly allocated to sectors. If a firm is employing workers it checks if they are "too costly"; if so they are fired.

Unemployed agents decide whether or not to apply for a skill upgrading. They choose to undergo a skill upgrading in the sector *j* only if the following two conditions are satisfied:

a) the vacancies in sector *j* are greater than a threshold;

b) the cost of the human capital investment is less than a defined payoff, according to a particular investment strategy.

The first condition limit tries to capture the "flexibility" constraint pursued by modern labour market policies, the latter is a wealth constraint.

The investment strategy is defined according to a learning model, which takes into account the job history of the worker, and measures the average payoffs the agent has gained in the previous periods if he was unemployed.

Each firm opens vacant positions and receives applications; it then randomly chooses one applicant, who fits with the firm's skills requirement (the hiring process probability depending on the history of the applicant and on a random parameter). The worker always accepts the first offer he gets.

At present, the population level is considered stable, assuming that the simulation covers a short period of time, during which the workforce doesn't significantly change.

[2] http://ccl.northwestern.edu/netlogo/. NetLogo is a multi-agent programmable modeling environment, authored by Uri Wilensky and developed at the Center for Connected Learning and Computer-Based Modeling at Northwestern University.

The level of randomness (considering the simple structure of the model) is anyway minimal, having the user the power to precisely tune most of the aspects of the simulation.

c. Functional Specification

In conjunction with firms and worker agents, that are the most important agents in the model, there are different variables that contribute to define the simulation environment.

- Firms (*Nfirm*), that hire workers, assumed fixed in time and space;

[Insert Table 9 about here]

- Worker agents (*Nwork*), that apply for jobs;

[Insert Table 10 about here]

- Variables, that define the environment.

[Insert Table 11 about here]

The model is initialized setting *Nfirm* and *Nwork*, and all the variables reported in Table 11; the model does not need external data.

[Insert Figure 8 about here]

The simulation then runs according to the following scheme (*Pseudo-code*):

Create firms and workers
Create sectors
Allocate randomly workers to sectors

Set initial conditions

for *n* periods

Dismissal
For each sector
For each worker
If worker's cost > threshold
Dismissal

Human capital investment
For each unemployed
If vacancy in sector *i* > *threshold* invest
else if calculate payoff
choose investment strategy
apply investment strategy

Hiring
For each sector
For each firm
If vacancy
If worker apply
Select worker
Else
Not fill vacancy

End *n* period

[Insert Figure 9 about here]

4. Experiments

The usual validation procedure involves multiple monte-carlo simulations and the analysis of the aggregate data (Lewkovicz, Z., Domingue, D. and Kant, J.-D. 2009). Using NetLogo the procedure is performed through the "Behaviour space" tool that allows the user to set up experiments with multiple repetitions.

Moreover, BehaviorSearch[3], a software tool implemented to help with automating the exploration of agent-based models, by using genetic algorithms and other heuristic techniques to search the parameter-space, has been tested.

BehaviorSearch provides a low-threshold way to search for combinations of model parameter settings that will result in a specified target behaviour. According to the BehaviorSearch documentation the model exploration follows four steps:

- Designing a quantitative measure for the labour market outcome or policy that policy maker is interested in;
- Choosing parameters to vary and what ranges are allowed;
- Choosing a search algorithm and running it;
- Final examination of the results, studying what parameters most affect the initially defined labour market outcome or policy.

By changing the model parameters, the user can therefore explore alternative policy measures that might lead to different labour market outcomes altering the economic efficiency of a given policy. For example, by assuming a 1 percent intensification for the "layoff" threshold, the policy maker con obtain a 0.58 point decrease in the unemployment rate, 2.63 in percentage less than the initial estimated rate.

Finally, the versatility of the model allows the integration of any further information gathered about the regional labour market or the implemented form of each Active Labour Market Policy (ALMP).

[Insert Figure 10 about here]

[3] BehaviorSearch.org. The design and implementation of BehaviorSearch was one aspect of Forrest Stonedahl's doctoral thesis research, with adviser Uri Wilensky, at the Center for Connected Learning and Computer-Based Modeling at Northwestern University.

The setup of two test-experiments is described below. In the experiments that follow, different run-periods of the algorithm described in the Functional Specification paragraph are selected.

4.1 Subsidized training

A first base test concerns the impact of an increased subsidized training: comparing a "base" and an "incremented" subsidy.

The worker agents are divided in two groups, one of "base subsidized" and one of "incremented subsidized" workers; then the simulation is run. The employment rate is checked against the base condition.

The user input values are set to:

- NFirm [15]
- NWork [50]
- initial_wealth [10]
- strict [0.99]
- thrsprev [4]
- memory-size [5]
- number-strategies [10]
- thrsflex2 [0.7]
- thrsflex3 [0.5]
- foreign [0]

After 1000 steps, the tool provides an increase in the average final employment rate of 2 points.

Assuming a higher initial wealth of 15 and a lower strict value of 0.98, the effect of the "incremented subsidy" disappears. This implies that, according to the model, subsides are not effective if the labour market is more flexible and therefore policy makers should invest in different policies (i.e support for job search).

4.2 Job displacement effects

A second experiment concerns the analysis of the treatment effects on the individual and the macro-economic level. ALMPs cause an increase in the size of the labour force and this involves more competition in the labour market and could produce the opportunity for firms to dismiss "non subsidized" workers and to replace them with "subsidized" workers (Froy and Giguère, 2010). The simulation assumes therefore that the subsidy "improves" the past history of the applicant, increasing his hiring probability.

As before the worker agents are divided in two groups, one of treated and one of non-treated workers; the agents from the non-treated group do not receive subsidies.

The experiment is divided in two phases. In a first simulation round no subsidies are given neither to the treated workers nor to the non-treated workers, then in a second round the agents that belong to the treated group are subsidized.

Finally, the last differences between the employment rate of treated and non-treated agents for both round are compared.

As in the previous experiment the user input values are set to:

- NFirm [15]
- NWork [50]
- initial_wealth [10]
- strict [0.99]
- thrsprev [4]
- memory-size [5]
- number-strategies [10]
- thrsflex2 [0.7]
- thrsflex3 [0.5]
- JobDisplaceSub [0]
- foreign [0]

In this case, after 1000 steps, results shows a negligible difference in the average final employment, showing that the macro effects, as the total skill level of the applicant or his human capital level, exceed the signal effect of the subsidy on the workers' history.

5. Discussion and perspectives

This agent-based model is intended as a first prototype of an agent-based regional labour market model with sector specific requirements.

We have highlighted a mechanism of the job search in a regional labour market characterized by a complex environment where firms, worker agents and policies interact in a systemic way.

At this point, the model is still experimental and calibration is preliminary (the initial conditions on *nSect*, *nFirm*, nationality, skills S_i and productivity P_i are based on empirical data, coming from a regional labour market analysis), but it already allows to approximate quite a number of stylized features of the southern Swiss regional labour market.

Human capital accumulation within the model is effective on its own to account for many formalised facts. Indeed, the model implies that skill improvement is essential in facilitating the matching process; furthermore, the flexibility level is a key part of an efficient labour market.

Moreover, the actual implementation of the model is effective in testing different scenarios useful in the evaluation of different policy setting. In fact, the tool permits to set model parameters on worker's nationality, agent's wealth, agent's strategy, worker's "learning constraint", flexibility of the labour market and differences between sectors. As an example, an improvement of the sectorial flexibility of the labour market can significantly modify the employment rate.

Finally, this paper proposes a general methodology, Agent-based Computational Economics (ACE), aimed to identify and quantify the effects of different situations and hypotheses together.

However, the approach of evaluating labour market policies with agent-based models entails strong assumptions and some issues. The model specification is a key factor that can involve difficulties and the calibration is still imperfect. In such models some issues such as empirical initialization, the limitations of data collection, empirical validation or the role of data in the design must be addressed. This procedure should be considered as a starting point and further improvements are strongly recommended.

In the study of labour market gender, age, education and nationality (local-foreigners) inequalities are four of the most relevant issues to have in mind; we are aware that the inclusion of a greater heterogeneity of agents (gender, age, formal education) is a difficult issue as it affects the labour demand function/decision rule in several ways. Anyway, introducing an empirically-grounded agent-based modelling technique, it should be possible to address some challenging issues in modelling of complex regional labour markets phenomena.

We finally consider enlarging the analysis to a wider geographical area in order to cover a greater labour market; the integration of a GIS module would make the policy maker self-confident with the geographical context.

Table 9 - Firm's state variables

Name	Type	Description	Updating	Initialization
firm				
region	patch	place where the firm is located	fixed	randomly assigned
Nvacancy	N = 1 + random 10	number of available vacancies	volatile	randomly assigned
sector	N = [1, 2, 3]	firm's Economic Sector	fixed	randomly assigned
Factory employed	N <= Nvacancy	employed number in the firm	volatile	computed

Table 10 - Worker agent's state variables

Name	Type	Description	Updating	Initialization
worker agent				
nationality	N = [0, 1]	worker's nationality (0 Swiss, 1 foreign)	fixed	computed: 20% of them are foreign
wealth	N = {0, 100}	agent's wealth	volatile	user input
subsidized?	N = [0, 1]	subsidized worker	fixed	user input
skills_level S	N = [1, 2, 3, 4, 5, 6, 7]	worker's skills level	volatile	randomly assigned
productivity P	N = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]	worker's productivity	fixed	randomly assigned
worker?	N = [0, 1]	worker (true or false)	volatile	0
strategy	N = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]	agent's strategy	volatile	randomly assigned
best strategy	N = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]	best strategy	volatile	randomly assigned
upgrade	N = [0, 1]	true if the agent currently plans to upgrade his/her skill level	volatile	0
prediction	-1.0 < R > 1.0	current prediction of the skill upgrade	volatile	randomly assigned

Table 11 - Variables in the model

Name	Type	Description	Updating	Initialization
strict	0 <= R >= 1	“layoff” threshold	fixed	user input
thrsprev	N = {0, 50}	"learning" constrain	fixed	user input
memory-size	N = {0, 10}	agent’s memory size	fixed	user input
number-strategies	N = {0, 20}	agent’s maximum number of strategies	fixed	user input
thrsflex2	0 <= R >= 1	"flexibility" constrain secondary sector	fixed	user input
thrsflex3	0 <= R >= 1	"flexibility" constrain tertiary sector	fixed	user input
employment rate	0 <= R >= 1	employment rate	volatile	computed
unemployment rate	0 <= R >= 1	unemployment rate	volatile	computed
skills level	N	total skill level	volatile	computed
foreign	N = [0, 1]	nationality discrimination	fixed	user input
JobDisplaceSub	N = [0, 1]	increase subsidy 10%	fixed	user input

Figure 7 – Model interface

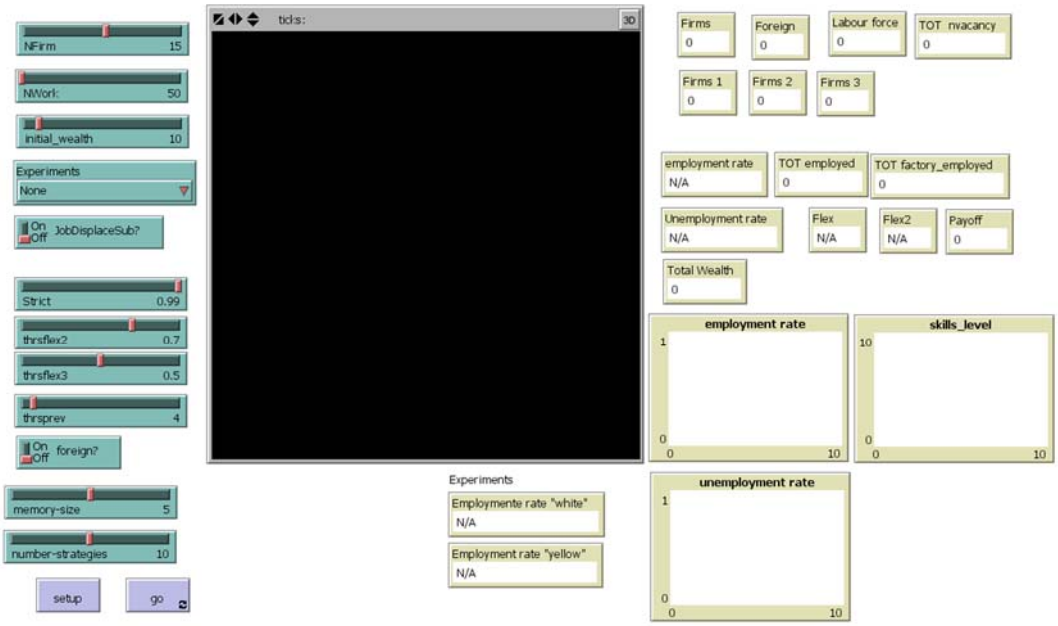


Figure 8 – Model setup

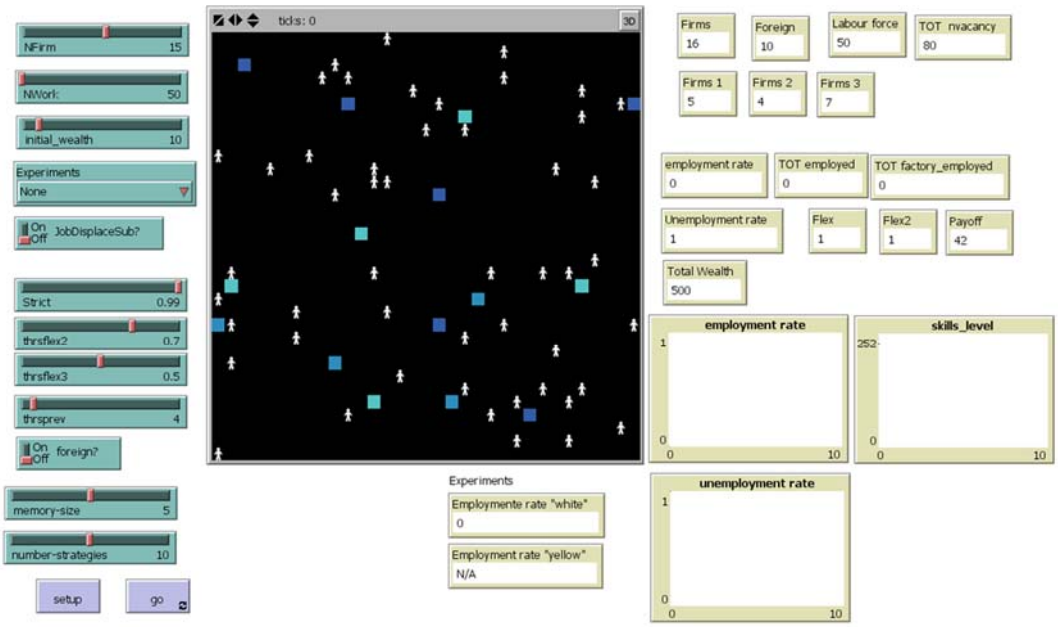


Figure 9 – Model running

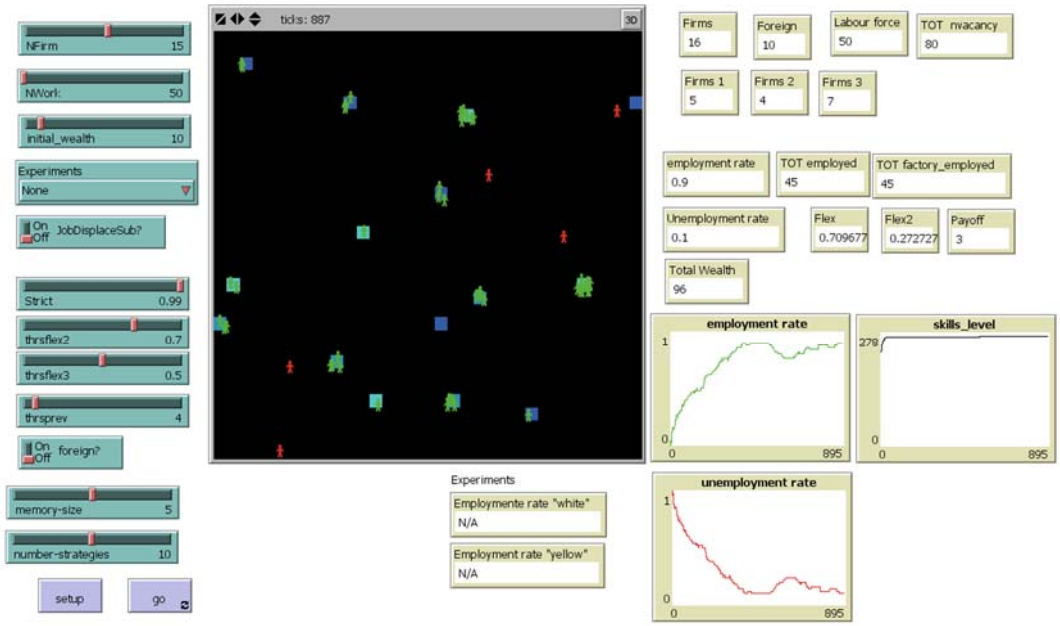
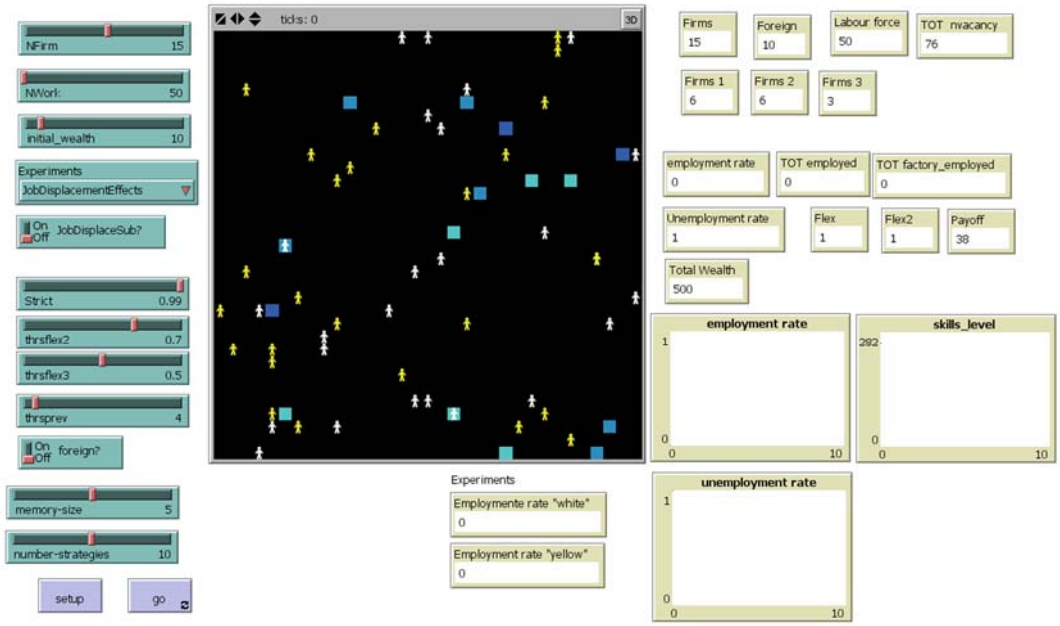


Figure 10 - Experiments



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Conclusions

Conclusions

Switzerland, which is a federal republic consisting of 26 regions (Cantons) has been characterised by considerable stability and consensus building. The legislative process is largely decentralised, with a strong role given to the Cantons and to elements of direct democracy. For this reason, there is regional variation in Switzerland, concerning financial capacity, employment patterns, unemployment levels and welfare dependency.

The Swiss labour market is characterised by high employment rates, low unemployment and high wage levels: over the past three decades, the Swiss labour force has grown from about 3 million to 4.8 million people. The main factors underlying this good performance are normally considered to be a high degree of labour market flexibility, with decentralised wage bargaining and relatively low employment protection regulations, supported by a strong focus (at least since the mid-1990s) on active labour market policies and employment services characterised by strong "mutual-obligation" principles. The high share of part time in total employment (26.0% in 2012, compared with an OECD average of 16.9%) and the share of temporary among total employment (13% in 2013, slightly above the OECD average, 12%) are bright results of this rules. Another feature of labour market performance has been the design of immigration policies, which in the past implied the use of immigrant labour as a labour supply reserve that left the country in times of economic hardship.

However, Switzerland has not escaped the global economic downturn starting in 2008: the impact of the recession on the labour market, at first relatively modest, nevertheless led to a 30% rise in unemployment, from 3.5% in 2008 to 4.4% in 2009, and only recently it has been starting going down (4.1% in 2013 - last quarter).

The study of perceptions of economic insecurity in Switzerland, during the business cycle between 2008 and 2011, has been the subject of

the research in the first essay. The analysis contributes to depict perceptions of Swiss workers. A comprehensive dataset, the Swiss Household Panel (SHP), which is based at the Swiss Centre of Expertise in the Social Sciences FORS, has been used. I show that perceptions are similar to those obtained from studies conducted in other European economies: perceptions of job security tend to be higher among workers with supervisory responsibilities, among permanent workers and among workers who live in regions that are not adversely affected by economic conditions. Moreover, perceived job security in non-public sector jobs is lower than in public sector jobs, which seem to be more generally perceived as safe jobs and protected from labour market shocks.

Unlike previous studies, however, I found that perceptions do not strongly differ between workers with different levels of education and age is not positively correlated with confidence in keeping one's current job.

My results should help understanding the reasons that influence job insecurity: from a policy perspective, local authorities should increase their awareness that policy-specific information is processed with a bias; otherwise, policies may have unanticipated economic consequences.

Moreover, this study contributes to the literature by revising important variables that help to explain the formation of job insecurity perceptions, emphasizing the need to critically question rationality assumptions in many economic models. My results seem to confirm, indeed, the necessity to use cardinal rather than ordinal scales.

The research proposed in this thesis has followed a path from microeconomic to regional aspects of complexity, examining the link between job security, flexibility and job satisfaction.

The second essay extends therefore the analysis studying the determinants of perceived job satisfaction, a summary measure reflecting how workers value various job characteristics, paying specific attention to the role of perceived security and temporary contracts. I split workers into four groups according to the flexibility/security mix characterising their employment relationship and I analysed the impact of this mix on overall

job satisfaction. Using the same dataset as in the first essay, I have shown that it is not the formal security as defined by the contract type or the working conditions alone that matter for job satisfaction but the subjectively perceived job security.

My results indicate that the duration of the contract may be less important if the worker perceives that he is not at risk of unemployment: job stability and perceived security are nonetheless valued in different ways and the lack of job security is a primary source of job dissatisfaction. No significant differences emerge on the estimated effect by gender, while some heterogeneity is evident by age and education.

The comparison with previous studies on the subject shows that my job stability estimates are consistent with the evidence for other developed economies, where job stability has been found strongly linked to workers' well-being.

Form a policy perspective, the results presented in this dissertation prove that the adoption of a proper mix of flexibility and security has a crucial impact on perceived security. They should encourage both labour authorities and firms to shift toward a "flexicure" model, which implies a higher, but more efficient, labour turnover.

Finally, the results presented in this thesis should encourage additional empirical research on the use of a linear fixed effects model (FE POLS) for the analysis of subjective economic variables.

Last, the third paper highlights a mechanism of the job search in a regional labour market characterized by a complex environment where firms, worker agents and policies interact in a systemic way. I have programmed and set up an agent-based model (ABM) of a regional labour market model with sector specific requirements.

The model is still experimental but allows to approximate quite a number of stylized features of the southern Swiss regional labour market.

The tool allows the user to set model parameters on workers' characteristics, on the flexibility of the labour market and on differences

between sectors and it is effective in testing different scenarios useful in the evaluation of different policy setting.

Conversely, the approach of evaluating labour market policies with agent-based models still entails some issues: the model specification is a key factor that can involve difficulties and the calibration is still imperfect. ABMs may actually be hostile to policy makers, as they might confront them with the fact that for many of their objectives, they have limited control options, as it takes technical expertise to run and interpret them.

This thesis proposes a methodology, Agent-based Computational Economics (ACE), aimed to identify and quantify the effects of different situations and hypotheses together: the procedure presented in this dissertation should be considered as a starting point for further improvements.